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THE

JOURNAL OF SCIENCE.

OCTOBER, 1884.

I. MORAL EPIDEMICS AND CONTAGIONS.

THE word "moral" is condemned to serve as a kind of general antithesis, whenever such is needed. Thus it is alike employed in opposition or in contradistinction to "immoral," to "intellectual," to "logical" (as when men speak of a moral certainty or a moral impossibility), and to "physical." It is in the last sense that we shall make use of it.

The contagion of moral phenomena, and their propagation to a distance, has been recognised in all ages. It would be very superfluous to give instances of the spread of delusions, manias, hysteric phenomena, &c., since the chronicles of the dancing mania, of the doings of the flagellants, and the like, are duly recorded in history.

But one consideration must not be overlooked. The epidemiologist can tell us of the inroads of plague, of cholera, of smallpox. But they have no case on record where an epidemic of higher health, of increased vigour, has overspread a country or a continent. Just in the same manner with moral and intellectual phenomena: we are familiar with the spread of delusions, of follies, but we find no instance of a sudden and seemingly unaccountable fit of sound sense or rationality sweeping over a body of men, a class, or a nation. Hence we have the corollary that any "movement" or agitation, be it political, social, or religious, is in all probability essentially morbid in its origin and character. It is a pathological phenomenon most prevalent among individuals of ill-balanced intellect, and in nations where the penumbra of mental derangement is broadest.

For instances we need only point to the "Anti-Vivisection" movement, to "Anti-Vaccinationism," to the opposition to the "Contagious Diseases Act," to the examinational mania, and the like.

Now the causes of the spread of such "movements" have not been hitherto understood. We may therefore, with advantage, take into consideration the views which M. J. Rambosson has brought forward in memoirs read during the last few years before the Institute of France. He points out that the spread of delusions has been hitherto accounted for by strange and contradictory hypotheses.

It has been ascribed to miasms, to indefinite commotions, to imitation, to fascination, to witchcraft, or demoniacal obsession.

M. Rambosson has shown that this contagion depends on a single law, easy to be demonstrated, and at once most simple and exceedingly vast in its sphere of action, if we may judge by the number of phenomena which it governs.

The cause of the contagion is due to the transmission of the cerebral movement to which the phenomena in question are due in the individual.

This transmission takes place from brain to brain, through the ambient medium, without being modified by its successive transformations, just, *e.g.*, as the *materies morbi* of yellow fever retains essentially the same character, no matter through how many successive persons it may have passed. It reproduces, or tends to reproduce, in the persons whom it reaches the same phenomena as in the persons with whom it originated, such as yawning, neuralgia, epileptiform phenomena, panics, madness, suicide, identical or analogous crimes.

When it has reached the brain this movement is not extinguished, but it is transmitted to the nerves and muscles, and is developed outwardly, reproducing the contagious phenomenon.

The action is, therefore, first centripetal and then centrifugal.

We are here reminded of the views of Professor Gustav Jaeger (*see* "Journal of Science," 1880, pp. 282 and 298), and we believe, to some extent, of Dr. B. W. Richardson (*see* "Journal of Science," 1881, p. 623). But both these *savants* refer the contagion of mental affections, or of insanity, to a material something given off, and not, like M. Rambosson, to a molecular movement capable of impressing itself on neighbouring organisms.

The cerebral movement which propagates itself from

brain to brain without losing its nature may be followed, thanks to the means which Science puts at our disposal, step by step, from its point of departure to its point of arrival, without being lost to sight for a moment or escaping from our observation. There is here nothing hypothetical.

This propagation of the identity of the cerebral movement has not been contested by any of the *savants* who have followed M. Rambosson's demonstration. It appears that this movement produces different phenomena in different media, but without changing its nature,—*i.e.*, it reproduces identical or analogous phenomena whenever it encounters an identical or analogous medium.

In this law of the transmission and transformation of the movement which produces the contagion there are two principal points to be considered:—

1. The cerebral movement which passes from brain to brain without changing its nature.
2. The reflex action which this movement tends to determine after reaching the brain, and which becomes the proximate cause of the contagion.

The reflex action which this movement tends to determine, and which realises the contagions in question, does not always take place, and this fact has raised some objections on the part of those who are not perfectly familiar with the nature of reflex action in its different phases. But these objections do not affect the law, which is indeed confirmed by their scientific explanation.

The contagion of nervous phenomena ensues, then, as the immediate consequence of a reflex movement.

All that is observed in the production of an ordinary reflex movement is equally observed in the propagation or contagion of these phenomena. There is an essential difference in the origin of the physiological movement which produces ordinary reflex action and that of the physiological movement which produces the contagion.

The first-mentioned has its origin in the same person in whom the reflex phenomenon is manifested; whilst the other, producing the contagion or the propagation of the phenomenon to a distance, has its origin in a strange brain (a very strange one, sometimes, in a quite different sense of the term!), and is transmitted through the ambient medium to the brain of the person whom it attacks.

For instance, digestive troubles or hindrance in respiration give rise to a centripetal movement which on arriving at the

brain produces yawning. Such yawning is evidently not due to contagion; it is symptomatic of some direct cause, and it might be called spontaneous.

But this yawning may become transmissible, because the cerebral movement under the influence of which it is produced may be transmitted to other brains without altering its character. It thus gives rise to an indirect reflex action, and to what is called the contagion of a nervous phenomenon.

This indirect reflex action is very remarkable from the origin of the movement which determines it, and must be specially distinguished from the other.

In more complex cases the process is not dissimilar. A man of strong will, a believer in himself, possessing great self-reliance, or at least a great power of self-assertion,—we mention here no names,—falls under the influence of "dominant ideas." We have not here space for the analysis of the process, but these dominant ideas are quickly transferred to the brains of others, and may become an epidemic, local, national, or universal. We may remark that the moral contagion from a powerful brain is dangerous in proportion to its power, just as is perceived in the transmission of diseases from one animal species to another.

M. Rambosson has carefully studied the circumstances attendant upon this reflex action. Careful and minute observations and repeated experiments have led him to the following observations:—Many of these results have been recognised in ordinary reflex action, but they catch a new light from the application thus made of them to the transmission or propagation of nervous phenomena. Others of the results have been newly discovered by M. Rambosson.

1. Those reflex movements which produce contagion are sometimes conscious and at other times unconscious. They may be automatic, instinctive, or voluntary and reflective.

Thus, for instance, if any person yawns in our presence we may allow ourselves to yawn without being aware of it, and may even be surprised to find ourselves yawning.

At other times we are perfectly aware that we are about to yawn.

At other times, again, we resist the yawning, and by a voluntary reflective act we neutralise the reflex movement which tends to display itself outwardly in the form of yawning. And by frequently repeating this effort we become at last able to neutralise the movement without much

difficulty. This can be remarked in all persons who are accustomed to respect the usages of good society.

Further, we remark in such persons that they acquire the power of resisting this reflex action instinctively, and even unconsciously, the reflective voluntary resistance thus becoming instinctive by repetition.

This fact is important, since the truth which it teaches may be generalised and be applied to *other contagious nervous phenomena*.

Thus men who have reached a certain stage of culture, intellectual and moral, become proof against the contagion emanating from the platform orator, and, retaining their cool judgment, they smile at his rhetoric; they see through his sophisms, and detect the nature of his *quasi*-facts. Should the people of England ever reach this stage, the professional agitator will have to seek some other calling.

A number of automatic movements may, by attention and exercise, pass under the dominion of the will, and in like manner a number of actions originally voluntary and reflective may by dint of exercise become automatic, and this as well in ordinary reflex actions as in those which give rise to contagion.

2. Various similar movements, simultaneous or successive, may be produced in an assemblage of individuals, and may thus give rise to reflex actions concurring to one and the same effect. We see this especially in military exercises where similar movements are executed together.

Says the Baron Larroy, "It is in the manœuvres of troops that precise and rapid reflex actions are best seen and appreciated. . . . There remains an influence which must be taken into account in this study of the reflex actions that is the influence of proximity, of individual upon individual. Contact in the ranks produced the most decided reciprocal or reflex action in a troop.

"Is it not, in a situation of a quite different order, what may be observed in the case of two performers singing a duet, if they hold each other by the hand? It has often seemed to me that thus instinctively approximated by tactile union they understand and support each other the better, giving to the piece which is sung more accord, more correctness, and more harmony; such is the reflex action of music."

3. The contagious reflex movement, under the influence of the same causes, is not exerted equally, nor at all times upon all persons.

Thus if any one yawns among those present, some are at once induced to do the same; others either not at all or only after a second or a third repetition of the action.

In an independent work* M. Rambosson has adduced some curious facts on this subject. Thus repetition does much to determine the contagious reflex movement,—a fact well known to physiologists as regards ordinary reflex movements.

Each separate movement is added and accumulates, and the sum of all these separate movements produces a reflex action more energetic than if the whole had ensued at once. Series of experiments have shown that such movements may assist each other even when separated by an interval of several seconds.

We find in a classical work† the following passage:—"An excitement too feeble to induce a reflex movement may become effective by being repeated. Ten, twenty, thirty slight shocks, repeated at intervals of a second, may in some manner add themselves together, and determine a reflex action even more energetic than would the sum of all these small shocks acting at once. Mr. Stirling has remarked that feeble excitements may multiply their effects even when they are separated by intervals of two seconds."

In certain cases it has even been found possible to measure the sum of the excitements necessary for the production of reflex action.

4. One and the same reflex movement may produce opposite effects, according to circumstances.

This phenomenon is important to establish, since its explanation becomes fruitful by the light which it throws upon all analogous facts.

For instance, a military march is heard. As soon as the sound-waves reach the brain of the hearers a reflex movement is produced which impels each one to follow in his own movements the cadence expressed.

We often see even children manifest this with perfect accuracy.

* "Les Phénomènes Nerveux Intellectuelles et Moraux; leur Propagation par Contagion." Paris: Firmin-Didot.

† BECLARD'S "Physiologie," 2e part., p. 426.

The men marching are naturally aided by this movement, and follow its impulse spontaneously.

Persons at rest feel all their limbs more or less agitated by the same cadence, and express it instinctively in one or another manner.

This reflex movement determined by sound-waves may thus be recognised in a very striking manner.

But here we are led to another important observation: this cadence aids, by the reflex movement, the men who have to march, sparing them the fatigue of a movement which they would otherwise have to give themselves in a direct manner.

This explains the reason, hitherto unknown, of analogous influences which are observed in a multitude of cases.

For persons who wish to remain in a state of total rest—or, indeed, to act in some heterologous manner—these sound-waves, when they excite their corresponding reflex action, will prove annoying instead of agreeable. Such persons will feel fatigued instead of aided, for, in order to keep still, they will have to struggle against this reflex movement just as we struggle against the reflex movement which tends to reproduce yawning, when we do not wish to yield to it.

These considerations are fruitful in consequences. By their means we are led to recognise the physical and moral influences of music and of all the fine arts,—not forgetting eloquence,—to formulate the laws of this influence, and to determine with precision their sanitary and therapeutical applications.

This *modus agendi* of the contagious reflex movement explains facts to which it would seem at first quite inapplicable.

We may generalise these notions and explain scientifically a number of facts which otherwise appear contradictory.

Sometimes, for instance, we love gay impressions, whilst sometimes we love melancholy impressions. If we have motives for giving ourselves up to sadness we have a satisfaction in this condition. At such times smiling countenances, joyous songs,—in a word whatever is gay annoys us, because we are obliged to struggle against the reflex contagious movement in order to remain in the state which we have chosen. On the other hand, everything conducive to sadness will please us, because it agrees with our condition. Gay impressions fatigue us, and do not readily

exert on us a contagious action, on account of the instinctive struggle of the *ego* against the reflex action which tends to produce them.

(To be continued).

II. ON THE DISTRIBUTION OF COLOURS IN THE ANIMAL WORLD.

SIGNOR LORENZO CAMERANO has been for some time engaged with the study of the distribution of colours in the animal kingdom. He has communicated his results to the Academy of Turin, and has given an abstract in the "Zoologischer Anzeiger" for July last.

He first examines the respective frequency of occurrence of different colours in the animal world, and arranges them in the following order:—1, Brown; 2, black; 3, yellow, grey, and white; 4, red: 5, green; 6, blue; and 7, violet, the rarest. It will be observed that Signor Camerano ranks here black and white, and their mixture grey, as colours.

These colours are, however, by no means equally distributed in the main groups of the animal kingdom. Black, brown, and grey, we are told, are more abundant—relatively of course—among the vertebrates than among arthropods. Red and yellow, on the other hand, are more frequent in the evertebrate animals. Green, also, is frequent among the lower animals, with the exception of the molluscs, but is also abundant in vertebrates, though, it might have been added, not among mammals. Violet and blue are the rarest colours, especially violet, though we meet with it in almost all animal groups. White is very irregularly distributed, but occurs most frequently among aquatic forms.

The colours of animals are, on the whole, directly related to the medium which they inhabit.

Parasites have less decided and less manifold colours than those which lead an independent existence.

Aquatic animals have in general more equable and less intense colours than terrestrial forms. Pelagic species have

rarely striking deep colour,—a fact which must be connected with the frequent transparency of their bodies.

Sea-animals which live among Algæ, and in situations rich in marine vegetation, have a more varied and lively range of colouration than such as live among stones or on the sandy bottom.

The dull, sombre colouring of fresh-water insects needs only a passing notice.

High- and strong-flying birds have not, in general, a striking colouration.

Land-animals, which live in the woods, beneath herbs, on bushes, or on flowers, &c., have more manifold and more striking colours than the inhabitants of bare sandy or rocky localities. The "Desert colour" of the Arabian and Saharan fauna has been particularly insisted on by Canon Tristram.

Contrary to the somewhat premature assertion of Mr. Grant Allen, there is no universal and constant connection between the colouration of animals and the nature of their diet. Insectivorous, or rather zoophagous, animals, which live under leaves and among flowers, have often brilliant and varied colours; whilst phytophagous species, if they do not regularly inhabit leaves and blossoms, are often dull and monotonous in colour.

Still this generalisation is as far as that of Mr. Grant Allen from accounting for the splendid colouration of, *e.g.*, the genus *Phaneus*, devourers of excrement and carrion, among which they have their dwelling.

The richer an animal group is in species the more varied, and in many cases the brighter, is their colouring. This law is well illustrated by the humming-birds. But it fails us in not a few striking cases, among which we need merely mention the great group of the Brachelytra, or rove-beetles, the Harpalidæ, and the genus *Aphodius*.

The development of colour bears no direct relation to the proportion of light to which the animal is exposed. It is rather directly connected with the general development of animals. Defective nutrition and diseases impoverish the colours.

We need scarcely add that the views of L. Camerano, as regards the influence of light, agree substantially with those of Mr. A. R. Wallace.

A very dry climate seems to darken colours, whilst a very moist one rather brightens or lightens them. The colours of animals are modified by the altitude of the station of a species above the sea-level. The higher we

rise the more intense are the colours which we encounter.

With this proposition we can scarcely agree. A mountain fauna is generally speaking more sombre than that of the adjacent plains,—a remarkable contrast to the Alpine flora. This fact has indeed been cited as an argument against Mr. Grant Allen's theory of the colouration of animals.

Species confined to islands have often darker colours than those inhabiting continents. This conclusion holds strikingly good as regards many varieties inhabiting small islands.

It will be seen that the colouration of any given fauna is a result depending on a complex of factors, the respective influence of which it will not be easy to estimate.

The different zoo-geographical regions of the earth seem to have certain more or less predominating colours.

In the Palæarctic region white, grey, black, and yellowish are frequent; in the Ethiopian, yellow and brown; in the Neotropical, green and red predominate; in the Indian the yellow tones occur very plentifully; whilst in the Australian dark colours, and especially black, take the lead.

Generally speaking, throughout the animal kingdom the more bulky forms have more monotonous colours than smaller forms belonging to the same group.

In almost all groups of animals those parts which are less visible are often brightly coloured or spotted, whilst the other parts of the body are more frequently uni-coloured and dark. Here, however, we are reminded of the very numerous cases in insects where the brightest colours appear to be seated in projecting parts, such as the extremity of the abdomen, the tips of the elytra in Coleoptera and Hemiptera, the margins of the wings in butterflies, &c. So frequent is this phenomenon that some naturalists have thought it a protective arrangement,—a bird, *e.g.*, being more likely to strike at these brightly-coloured out-lying parts than at the more sombre vital regions.

Sexual colours are directly connected with the general development of animals. The males have in general brighter colours. In many cases, however, where the females are larger and stronger than the males, they, in turn, are the more gaily coloured.

The colouration of young animals is often very different from that of the adults, and—where a sexual difference exists—it generally resembles that of the female, in which consequently "Neotenism" (*see* "Journal of Science," 1884, p. 531) is recognised. In many cases the young of different

species resemble each other closely in their colouration, though the adults are quite distinct.

Whilst thus giving an abstract of the very interesting results of Signor Lorenzo Camerano, we are fully conscious that some of them—as we have pointed out—require further consideration. It must have struck many of our readers that researches on the colouration of animals have, so far, left the physical side of the question scarcely touched. The production of the colouring-matters, their occurrence in one species and not in another, and the mechanism of their distribution have still to be dealt with. It strikes us that in the production of the design—in, *e.g.*, the wings of a butterfly—the principles of capillary attraction and of diffusion must come into play. By mixing certain colours which have different rates of diffusion, and placing a small drop of the mixture on white blotting-paper, designs may sometimes be obtained which roughly resemble those we meet with in the wings of Lepidoptera.

III. THE HEALTH EXHIBITION.

No. III.

ONCE more we return to this popular display to notice a few points which we had previously overlooked. Disinfectants are, as a matter of course, not absent. As sings the poet Buchanan:—

> "Down the steep valley, on her ass
> Rideth the maiden Sanitas."

Messrs. Savory and Moore have a fine collection of the leading antiseptics of the day,—salicylic acid, phenol, eucalyptol, thymol, &c. The phenol (pure) is very slightly tinted with pink, the inevitable result of exposure to light. All these specimens are exceedingly beautiful.

"Ozonine" deceived us: we expected that it was some novel antiseptic; but behold, it is a beverage, to be consumed instead of champagne.

We were particularly struck with the exhibits of the

"Icipie" Manufacturing Co., of Cannon Street. On the table was a common grass-snake (*Tropidonotus natrix*), preserved in a liquid named "Balma," and recommended as being superior to alcohol for such purposes. Every naturalist will agree with us that alcohol is a most troublesome article to carry about in semi-civilised—not to speak of savage—countries. It is sure to leak away or evaporate, and is, moreover, in great danger of being swallowed by the natives, unless they are Islamites,—sometimes along with the specimens preserved in it. A substitute not open to these objections would therefore be invaluable.

It would have been well if the Iciple Company had exhibited comparative specimens, say of snakes, preserved respectively in "Balma" and in alcohol. But "Balma" has, it appears, many other virtues; it prevents, we are told, "mortification in amputations, allays inflammation, cures cancers, diphtheria, croup, whooping-cough, thrush, ophthalmia, smallpox, scarlet fever, measles, ringworm, snake-bites, and all kinds of eruptions." If but a small portion of this is true the inventor may rank as a distinguished benefactor to humanity. But would he allow himself to be bitten, *e.g.*, by a cobra, in reliance on the curative power of "Balma"? A cure for smallpox would be even a greater boon, as it would at the same time be a permanent remedy for anti-vaccinationism.

"Weiher's Mosquito Fluid" is said to prevent the approach of mosquitoes. This preparation may not impossibly be the tincture of marsh-rosemary (*Ledum palustre*), a preparation which we know, from personal observation, banishes these pests.

The same Company manufacture "Crystalline," of which they say that "its chemical action, harmless and innocuous to human life, infallibly destroys every germ of impurity in water, leaving it pure, sparkling, and cold. It is an essential requisite in every household, and should invariably be used in drinking water, filtered or otherwise."

What will Dr. Jabez Hogg say? Surely if these claims can be substantiated,—if disease-germs and microbia generally in drinking water can be infallibly destroyed by a preparation harmless to human life,—the recent difficulty concerning the possible admission of sewage into our water supplies is overcome.

But this important article by no means exhausts the lists of the Iciple Company. "Purita" is described as "an aromatic and highly-perfumed powder, perfectly harmless, but which acts as a most effective antagonist to the very

origin of parasites and insects of all kinds, which are instantly repelled by its atmosphere, in which insect-life cannot exist."

"Weiher's Insect Powder," which may perhaps be the powder of *Pyrethrum roseum* or *carneum*, is thus described:—"This excellent preparation is the *only one* which immediately destroys all obnoxious insects, such as moths, fleas, bugs, cockroaches, ants, &c., and at the same time being perfectly harmless to all domestic animals.

Lastly, we shall mention a new "Embalming Powder." We do not, indeed, approve of the practice of embalming the dead, which is far less rational than cremation. But a preparation which "at once arrests decomposition of the dead" would be a great boon in dissecting-rooms, and to experts who have to undertake toxicological cases.

We think that, if only a part of the claims made on behalf of these preparations can be experimentally substantiated, M. Weiher deserves high honours and great emoluments as surely as the inventors of new explosives, flying-machines, &c., merit a short shrift and a high gallows.

The exhibit of the Society of Public Analysts is exceedingly instructive. They display a number of the vile materials used in sophisticating butter, coffee, and other articles of diet. In defiance of united grocerdom they truthfully proclaim chicory to be an adulterant.

The comparison between the sanitary and the unsanitary houses, placed side by side, is indeed instructive. In the latter we see a fair type of the class of "residences, replete with every modern convenience," which are let at from £50 to £75 yearly, and which bribed surveyors, every five years, value at a higher figure, so as to raise the rates and taxes and encourage the owner to raise the rent likewise. There is the sewer carried right under the floor of the building, in the form of doubtfully-connected drain-pipes; there are water-closets, in the centre of the house, without air and light; there is the soil-pipe delivering gases into the cistern, and the absence of any systematic arrangements for ventilation and for removing the products of the combustion of gas. But where are the improvements to begin? The "sanitary" house would probably cost more to build than its unsanitary neighbour. Hence the rent will be higher. A vast number of people will thus be driven to run the risk of sickness, which they may escape, rather than encounter higher rents and increased local taxation, which are inevitable evils. The first step towards "sanitary" houses must be the elimination of the middlemen who have thrust themselves in between

the ground-landlord and the tenant-occupier. The second step would involve the abolition of the convention by which a dwelling-house—in contradistinction to a place of business—is officially considered to become of higher value as the neighbourhood becomes dirtier, noisier, and more crowded, and as all who can afford migrate further out into the country, whilst their place is filled by a lower class.

It will have been noted that our correspondent, Mr. Thos. Fletcher, has little hope for the introduction of earthenware stoves instead of our dirty and uneconomical fire-grates. He forgets that such stoves need not be costly structures of porcelain. Ordinary fire-clay tiles answer just as well. He overlooks, too, the facts that fuel is much higher in price than it was formerly, and that our winter, though not so severe as that of Holland, Germany, &c., is quite as long. The fire-clay stove is more under control as regards the temperature to be obtained than is the grate under any of its modifications.

Whilst speaking of sanitary and insanitary houses we cannot help referring to the "Introduction" to the Official Catalogue. A marginal note speaks of "former ignorance regarding sanitary matters." We submit that popular notions on this head are ill-founded. The Books of Moses and the Laws of the Buddhists show an acquaintance with sanitary science on a level with the knowledge of the present day, and in too many instances sadly ahead of its practice.

Says the Catalogue:—"Systematic drainage and water-supply for towns and villages were not thought of." What of ancient Rome, far better supplied with water than London or Paris, and, so far as we can judge, as well-sewered? As for domestic architecture the remains of Pompeii are superior to our towns, no less from the sanitary than from the æsthetic point of view,—no jerry-work, no lurking places for vermin or for putrescent matter; everything sound, hard, compact, so as to be incapable of absorbing foul gases or fluids. It is sad, indeed, that with all the economies and all the over-work of the modern world its children cannot afford to be as healthily housed as were their predecessors eighteen centuries ago.

The ancients were certainly not unacquainted with the water-carriage of sewage, though we have no evidence that they tried any method of purifying waters so polluted. In China, indeed, the use of alum in cleansing contaminated waters, so as to render it fit for drinking purposes, seems to have been known and practised from time immemorial. A quantity of water from one of their muddy, impure streams,

on the addition of a pinch of alum, seems to curdle or flake. In a few minutes the suspended matters go to the bottom, carrying with them no inconsiderable portion of the dissolved impurities. Indeed the experience of the French troops in Tonkin shows that the microbia present, though not destroyed, are carried to the bottom, so that the clear supernatant water may be drunk with impunity.

This brings us to one of the most interesting features in the Exhibition,—the process of the Native Guano Company for purifying sewage, waste waters, &c., before they are allowed to fall into the rivers. The sewage is mixed with clay and waste animal charcoal, a combination which powerfully absorbs the offensive matters dissolved in the water. Sulphate of alumina, or the corresponding hydrochlorate (hydrated aluminium chloride), is then added, which not only carries down with it the clay and carbon, with all that they have absorbed, but precipitates a very considerable proportion of the organic matters, whether such may be in suspension or solution.

This process is to be seen at work daily, though of course on a very reduced scale. We cannot help referring to an error committed by a medical contemporary, who stated that vegetables grown with the manure produced by the Native Guano Company's process were equal to those produced by the irrigation system. This is exceedingly faint praise. As far as we have observed, vegetables grown on sewage irrigation farms are deficient in flavour and firmness, and soon pass into a very offensive putrefaction.

Three firms engaged in the manufactory of sanitary earthenware—Messrs. Doulton, of Lambeth; Cliff, of New Wortley; and Wilcock, of Burmantoft—are distinguished for the high quality of their exhibits, not a few of which, however, though admirable in themselves, have no immediately apparent connection with public health.

Painters' colours are strongly represented. The firms Griffith and Co., Freeman and Co., the Torbay and Dart Paint Company (Limited), Turner and Sons, and Hare and Co.,—all display series of colours understood to be free from all objectionable ingredients. A reform in this respect has long been needed. White lead, which is so extensively used alone, and perhaps in even greater quantities in admixture with other colours, is most injurious to the workmen employed in its manufacture, to those who use it, and in many cases to the inhabitants of houses to which it is applied. Lead has been characterised as the meanest, the most perfidious, of poisons. The victim who gradually

absorbs this metal into his system is often unconscious of the evil until recovery is almost hopeless. We therefore wish good speed to those who are endeavouring to supersede the use of this treacherous metal alike in paints, in water-pipes, in the linings of pans, &c., and in the glaze of earthen utensils.

Much has been said, from time to time, about the possible mischief resulting from the use of arsenic and antimony in the arts of dyeing and printing,—not only in the colours employed, but in mordants and other accessory preparations. This question does not seem to have received any special attention at the Health Exhibition; at least we have not come across any display of poisonous dyes and mordants in contrast with harmless preparations destined to supersede them. It has been sufficiently demonstrated, especially by Dr. Grandhomme, superintending physician to one of the largest manufactories of artificial colours in the world, that these dyes, as now prepared and issued, are non-poisonous.

In the so-called "pigment-style" of tissue printing, where insoluble, mineral colours are, so to speak, cemented upon the tissue by means of albumen, &c., poisons are certainly used, such as the arsenical greens.

The use of arsenical pigments in getting up wall-papers has been much discussed both in technical and non-technical papers, some of the statements appearing in the latter being exaggerated and sensational. It will be noticed by visitors to the "sanitary" and "unsanitary" houses that the papers on the walls of the latter are labelled as "arsenical," whilst those used in the former are marked as being "free from arsenic." In this case the green colours are evidently for the most part chromic oxide or its insoluble salts.

The most painful sight in the Exhibition escaped our personal notice. We have been told that there is on view a cloak, belonging to a lady of title, trimmed with the skins of a large number of harmless and beautiful birds. Against such outrages we are sure all naturalists will join us in protesting. The Economists, of course, with their wonted narrowness of vision, say that laws forbidding such sacrifice would be "sumptuary," and therefore objectionable. We deny the assertion: the purpose of the needed law is not to restrain expense (*sumptus*), but to prevent the wanton extirpation of creatures lovely, innocent, and often directly useful to mankind. In the joint names of Science and Humanity we demand protection

for the wild birds against the *modiste* and the *plumassier* no less than against the Whitechapel bird-catcher and the Cockney sportsman.

IV. THE INFLUENCE OF HEAT AND LIGHT UPON VEGETATION.

DR. HELLRIEGEL has been engaged for some years in studying the action of heat and light upon the development of plants. His results, which are very important both from a practical and a theoretical point of view, were made the subject of an independent work,* and have also appeared in an abridged form in certain German periodicals.

He lays down the fundamental position that the stock of nutritious matter which is placed at the disposal of a plant is capable of being utilised and assimilated only when a given quantity of heat and light is simultaneously offered. The life of the plant lies within two well-defined limits of temperature. These limits differ not alone for every vegetable species, but for each physiological function.

Near the lower limit of temperature all the vital functions of a plant are effected with extreme sluggishness, but as the heat augments the energy of vegetation increases, and reaches its maximum at a certain degree, which may be called the optimum temperature. If this limit is overstepped the vital actions of the plant become feebler again,—probably by reason of abnormal processes and decompositions in the interior of the cells,—and cease entirely at a third upper limit.

The optimum temperature for the different physiological functions ranges between 68° and 104° F. (20° to 40° C.; temperatures above 122° F. (50° C.) have a destructive action upon the more highly-organised plants.

Light behaves in a manner very similar to heat. In complete darkness no green (chlorophyllaceous) plant can

* Beiträge zu den Naturwissenschaftlichen Grundlagen des Ackerbaues. Braunshweig.

prolong its normal existence. The germinative process alone is effected better in darkness than in the light. If a plant which has passed this stage is completely secluded from light the formation of chlorophyll is prevented, and any which has been previously formed is destroyed. The plant becomes pale, the stem and leaves assume a quite anomalous form, and the amount of total dry matter decreases.

The most important phase of the nutrition of plants, the decomposition of carbon dioxide (carbonic acid) and the assimilation of the carbon in the chlorophyllaceous cells, is purely a function of light,—in other words, it increases or decreases with the increase or decrease of light.

In a faint light the process of assimilation is feeble and tardy; it increases with the intensity of light, and reaches an optimum point, which, however, does not coincide with the maximum of light. Heat and light, together with the rainfall, form that complex factor in fertility which is understood by the terms "weather" and "climate." This factor determines the quantity of crops more frequently, and to a greater degree, than the natural factor known as fertility of the soil, and the artificial factor of manures.

It is generally supposed that the lowest limit at which the majority of our field-plants are capable of germinating is about 39° to 41° F. (4° to 5° C.). Observation, however, proves that this limit lies lower, approaching 32° F. (0° C.).

To decide this point Dr. Hellriegel, in the winter 1871-72, sowed the seeds of eighteen plants which he wished to study in a number of flower-pots. No. 1 was kept at the constant temperature of 8·7° C., No. 2 at 5°, No. 3 at 3°, No. 4 at 2°, and No. 5 at 0° C. The soil and the proportion of water were alike in every case. In this manner the pots were allowed to stand for 55 to 60 days. The temperature of the soil was determined at different times of each day, and the number of seedlings was noted.

At the end of the experiments the young plants and the seeds which had not germinated were washed out of the soil, and more closely examined. The seeds experimented on were winter rye, winter wheat, barley, oats, maize, rape, flax, tares, peas, horse-beans, clover, carrots, cress, and cucumbers. Winter rye was found to require the lowest temperature for germination. It sprouted at 32° F. (0° C.) quite normally, and developed both its seed-leaf and root-germ, though slowly. Winter wheat came next; it germinated at the same temperature, though more slowly than rye. Barley and oats required more heat; they put forth

their seed-leaf at 35½° F. (2° C.) though the root showed at 32° F. Maize, as might be expected, required the highest temperature among the cereals; it only began to germinate, and that slowly, at 47½° F. (8·7° C.).

Rape germinated at 32° F.; flax at 35½° F.; tares sprouted well at 32° F.; peas and clover at 35½° F.; beans and carrots at 37½° F.; whilst cucumber seeds showed no signs of germination even at 47½° F.

It must not be supposed that these results throw any light upon the temperatures required for the further development of the different species of plants. Further experiments were made in this direction with barley-seedlings. A series of flower-pots was taken, of which *a* was kept constantly in a water-bath at 50° F. (10° C.), *b* in one at 68° F. (20° C.), *c* in a similar bath at 86° F. (30° C.), *d* in one at 104° F. (40° C.), and *e* stood in a water-bath exposed to the fluctuating temperature of the atmosphere. In each pot were set two barley-seedlings, the soil and the water-supply being of course identical in every case. The experiment was continued from August 9th to November 9th, when the plants were pulled and analysed.

The plants in *e* showed a healthy, equable growth, and a good colour, and were evidently quite normal. Very similar were the plants in *b* (at 68° F.). Those in *a* grew unusually slowly, whilst the plants in *c* grew very rapidly. The former of these two lots, however, were of a deep luxuriant green, whilst the latter were duller and paler in colour. The plants in *d*, exposed to a constant bottom-heat of 104° F., were pale and sickly, and lagged behind in their growth. This temperature had evidently an injurious effect. For barley, therefore, a temperature of 68° F. seemed the optimum point, whilst 50° and 86° F. could not be pronounced hurtful.

Similar experiments were made with the seedlings of other cereals. It was found that wheat, in its first period of growth, requires a considerably higher bottom-heat than rye,—a result which agrees substantially with observation made in the fields in ordinary agricultural practice.

For rye in the first period of growth assimilation was found to be most active at 68° F., for barley 77° F., and for wheat at 86° F.

The question was next raised whether, and if so to what extent, transitory higher temperatures affect the growth of plants injuriously.

The various physiological functions of vegetable life are not all best effected under the same conditions of heat and light, but require unequal quantities of both. Thus the

respiratory process—till lately very frequently overlooked in plant-life—requires the smallest share of heat, and goes on even in the total absence of light. The assimilation of carbon makes higher demands both for heat and light, whilst the formation of certain chemical compounds requires a still more liberal supply of both.

These and other single physiological functions obtain a varying importance for the general life of the plant at its different vital epochs. Hence, as a necessary inference, the entire plant requires at its different stages different quantities of heat and light. As a general rule, as a plant approaches and reaches maturity, the more heat and light it requires. If the maximum intensity of heat and light does not coincide with the last period of the plant's life, but with the epoch of the most active production of leaves, the total growth is checked; the production, and consequently the development of the seed, is retarded.

If in this last period the supply of heat and light is insufficient, the reserve matter which has been accumulated in the leaves does not transmigrate completely to the seeds, but remains to a greater or less extent in the leaves, in the stalks, and in the seed-capsules. Hence the leaves do not wither, but remain green and juicy. In bad cases new shoots are pushed out, and the crop never ripens.

As the intensity of light and heat increases regularly from winter to summer, and reaches its maximum from July to the middle of August, the vegetative times of plants should be so arranged that the epoch of the formation of seed may fall about the end of uly. The seed-times for the different crops are therefore dictated neither by custom nor by economic circumstances, but by natural laws,—the relations of the plant to the earth's annual movements.

It is therefore evident that the productiveness of a country depends not so much on its mean temperature as on the question whether its supply of heat is received at the right time. It has been demonstrated by other observers, proceeding by the statistical method, that, other things being equal, the wheat-harvest in England is simply a function of the mean temperature of the months of July and August, unusual heat after harvest or in winter being, as far as corn-crops are concerned, simply wasted.

Dr. Hellriegel illustrates his conclusions as to the coincidences of the epoch of maximum heat with that of the formation of seeds by the following experiments:—He sowed barley, under otherwise identical conditions, on April 21st, May 28th, June 28th, August 2nd, and September 1st.

The first crop became ripe in 88 days, the second prematurely ripe in 87 (the maximum heat and light happening too early, before the plant was sufficiently mature); the third became imperfectly ripe in 150, the fourth in 200, and the last in 240 days!

In another series of experiments Hellriegel examines the comparative action of direct and of diffused light upon plants. He points out certain disadvantages to which plants cultivated in glass-houses are exposed. The motion of the air in an enclosed house is less perfect than outside (though it must be admitted that in England generally the movements of the air are far too perfect for vegetation). Another—and in our opinion far more important—difficulty is that even the best glass is not absolutely permeable to air and light, a certain portion being reflected or absorbed. Within the house a further portion of the light which has entered is absorbed by dark objects (plants, pots, soil, &c.), and converted into heat which does not radiate out at the same rate as it is produced. Thus the proportion between light and heat is different within from without: we hesitate, however, to endorse the author's opinion that this difference in proportion is always disadvantageous to plant-life. The proportion existing in the open air varies exceedingly, and there are few conditions more destructive to plant-life than one which prevails very commonly during the easterly winds of spring, when intense light is combined with a low temperature. It has been found that the blighting effect of such weather may be counteracted either by increasing the heat or by keeping the plants temporarily in the dark.

From Hellriegel's experiments it appears that from two sets of barley-plants, equal in number, those cultivated in direct sunlight in the open air gave 4282 m.grms. of grain, whilst a similar number grown in diffused light only yielded merely 873 m.grms.

A further subject investigated was the development of plants in light of different colours. The author's results by no means confirm those with which General Pleasanton astonished the world a few years ago.

It is a known fact that white light, after it has passed through our atmosphere, has not always the same qualitative composition. The author did not attempt to experiment with perfectly homogeneous, monochromatic light, but selected illuminations in which rays of a certain given wavelength predominated, others being more or less completely excluded. For this purpose he used very large roomy bells of coloured glass, which were kept regularly ventilated by

means of a petroleum lamp. Under similar bells of coloured glass, plants had been found capable of passing through their entire vital cycle without displaying any anomalous phenomena or yielding unusually small crops.

To determine the influence of different colours of light two bells were selected, the one of blue and the other of yellow glass, both of a medium shade.

The blue glass, coloured with cobalt,—as was found on examination of its spectrum,—transmitted, in addition to the blue and violet rays, the red and the green, apparently unhindered, the orange and yellow only being extinguished.

The yellow glass, coloured with carbon, transmitted all the rays except the blue and violet. The absolute intensity of the light was manifestly greater under the yellow bell than under the blue.

The barley-plants under both bloomed normally, formed good, perfect ears, and ripened finally in the ordinary manner without being distinguishable from other plants placed for comparison under a colourless bell.

The weight of all parts of the plants above the surface, when dried, was from the yellow bell 5291 m.grms., and from the blue bell 4431.

Two new pots of equal size were then planted with sprouting barleycorns, and placed under coloured bells. The blue bell was of the same colour as in the former experiment, whilst the yellow bell was darker, and the absolute brightness under it was small. The violet ray was quite extinguished, and the blue nearly so. Both plants showed nothing anomalous in their growth which might be ascribed to the specific action of the coloured light. They seemed merely like plants which had been partially withdrawn from the direct sunshine. There was no difference between the two, save that the plant under the yellow bell, which was the darker of the two, was the earlier in showing signs of weakness. The plant from the yellow bell gave 2·5725 m.grms. of dry substance, and that from the blue bell 2·7990.

It thus appears that plants are not very sensitive to moderate changes in the qualitative composition of the sunlight to which they are exposed.

It need scarcely be added that the wonderful effects which have been ascribed to the blue ray, or rather to light passing through ordinary cobalt-blue glass, cannot be considered as scientifically demonstrated.

V. THE HUMAN FACE.

By D. Y. Cliff.

WHEN men first detected that the voice, sight, hearing, smell, and taste were all situated in and emanated from the head, he looked upon it, and its contours and proportions became to him comparable and beautiful; he said, grandly, "It is the image of God!" How much does the rest of the body owe to carnal passions and "pride of might?" Admiration and appreciation have surely played a large part in our development. The intellect animal looks to the face—has it an idea of beauty? Do we recognise "beauty" in the brute creation from long inbred association, or have they themselves had a hand (or an eye) in it? The fact that it contains scarcely anything to cringe or terrify us, at first sight, would seem to prove this inbred familiarity. We find nature to be born *in* and *of* ourselves. There are more dangers in the artificial productions of Man than in the structures of Nature. The eye reaches further than the weapon; and it is easier to fall from a window than from a tree.

Some say the national face does not change, its apparent differences being the result of fashion—costume, hat, hair, &c. For my part it seems that the history of each age is painted on the faces of its people. Parents would seem generally to anticipate (or form) in fancy the realities of their offspring—probably unknowingly. I have, on several occasions, been struck by odd faces here and there which belonged to a past age. Some will, of course, smile at this. Once, *e.g.*, at a sham parliament in a Cheshire town, I saw an exact reproduction of the face (as generally represented) of the Georgian epoch of English history. The high cheeks, the ruddy skin, particularly the wide low forehead with its distinctive depression (almost) in the middle of the forehead where the head curves downwards, the broad face, the peculiar "look," &c."

The face of Charles I. suggests his artistic taste, his theological thoughtfulness (so general then), and a proud indifference to vulgar rowdyism. He was to his age what "Farmer George" was to his, and the Prince of Wales is to his—types thereof—the men thereof bearing one of its varied educations, but the same generally under each disguise.

It would be a long subject to discuss the features of the different ages in English history and speculate upon them, and perhaps foreign to this journal. It is this feeling we have, this recognition of a fact, that hurts our fancies to see an ugly artist, a handsome slave, and sometimes to wonder at the beautiful eyes some of our domestic animals possess. We find an innate pleasure in gazing on a handsome face.

The above causes, no doubt, have lent a diversity to the face of woman, which reacts on the man. The favourite type is "married up" in excess of others, and effectually impressed on the race. To this we may trace, probably, the widely diverged races of men, the Mongol, the Negro, the European, &c. The transmission of the family likeness, paternally and maternally, is interesting to reflex on. That was a scandalous remark, to me, I read, I think, in your journal, about the passing admirations of a mother being stamped on her children's faces. Why is not the husband, the favourite brother, the sister, the mother, father, &c., oftener reproduced, if that be the case—with the double chance? It is remarkable, though, that the eldest child seems very often to retain the strongest family likeness. But the strong likeness of brothers and sisters is an argument against it. Perhaps this is largely owing to their catching each other's expressions of countenance; and this again explaining why the "younger end" often differ so decidedly from their elders—lack of association. This same thing applies to nations; hence the force of the child's remark, "all Frenchmen seem to grin alike." A national contortion.

One would like to have seen the face of the Persians who made it part of their education to "speak the truth." We could have seen it! *Was* the Spartan stern in aspect who lived for his country's good? Was Deborah a Jewess in her look? Can we not read Byron's poetry in his face, and the heaviness of pondering judgments in Hallam's? Do you doubt, as you look at Nero's face, that he could fiddle whilst Rome burnt? And so on; a man's mind shines out of his countenance, the face in repose, or unanimated, is the generality of that individual's mind. And so we turn to look on the faces around us to-day. Are not the majority mere livers—mere nonentities? These will not remain in history, but they will form the nation's destiny!

Our souls were filled with sadness when we found inanity behind a lovely face. Nature lied to us! Do the choice minority conquer in the long run? It is one long fight.

VI. THE FUNCTIONS OF THE CEREBRUM.

THE question is debated among physiologists whether or not the grey cortical substance of the cerebrum presents distinct localisation of functions, so that the senses of sight and hearing and the action of the various groups of voluntary muscles may be referred to strictly limited portions of this stratum. The affirmative view is chiefly advocated by Professor Munk.

On the other hand, Professor H. Goltz, of the University of Strassburg, is led by his observations and experiments to deny every special limitation of the centres of certain groups of functions.

In order to prove that small, limited portions of the cortical substance are not the centres of given activities, muscular and sensitive, Goltz removed portions of the anterior portion of the brain, or of the occipital lobe, in certain dogs, sometimes on one side only and in other cases on both. He then studied the phenomena evinced by the animals months afterwards. In judging of the results he is guided merely by the minimum of the disturbances which occur after the operations in question, and regards all manifestations which appear in some of the subjects but not in others as mere collateral disturbances which throw no light on the functions of the parts removed. The operations, it must be remembered, affected not merely the cortical layer, but, to some extent, the white matter.

We extract from "Pflüger's Archiv für Physiologie" a summary of the chief results.

We have to distinguish animals which had undergone an extensive bilateral removal of the anterior lobe (*a*) from those (*b*) in which a considerable part of the occipital lobe had been extirpated. The following differences appeared:

1. A dog (*a*) retains sensation in all parts of his body. It is even demonstrable that, under certain circumstances, his sense of feeling is delicate. But he touches awkwardly, and treads (or attempts to tread) in vacant space. No muscle of his body is lamed or paralysed. He can move all his muscles at will, but his movements are clumsy and helpless. He is especially awkward in taking food. He does not understand how to hold fast a bone with his fore paws. He does not hesitate to leap from a height, but the movement is awkward.

An intensification of reflex excitability is regularly manifested.

There is very often a change in his moral character; he becomes more irritable and quarrelsome. He gives, invariably, proofs of a general excitement. He is impatient, distracted, and runs restlessly about.

The sense perceptions are not much enfeebled.

The intelligence is always moderately reduced.

2. A dog of the class *b* has his sense of touch undisturbed, and feels well. He does not step on vacancy.

He can not only use all the muscles of his body at pleasure, but these movements take place approximately with the same dexterity as in a dog in his normal condition. He displays no awkwardness in eating, and knows how to hold bones fast with his paws. He hesitates at leaping down even from a trifling height.

His reflex irritability is not increased.

If previously violent he becomes good natured after removal of the occipital lobes. He is free from excitement, and both in his bearing and movements he appears quiet, discreet, and tranquil.

He suffers from a general and well-marked weakness of perception.

His intelligence is profoundly reduced.

Professor Goltz further adds that dogs of the class *a* become and remain meagre, whilst those of the class *b* invariably grow fat.

According to these results, there cannot, as a critic in the "Naturforscher" observes, remain the slightest doubt that a dog which has lost the posterior lobes differs in very essential points from one which has undergone a corresponding operation in the anterior portion of the brain. Hence, even in the opinion of Professor Goltz, the lobes of the cerebrum have not one and the same signification. It remains, however, an open question in how far the pathological phenomena above described are dependent on the extirpation of the grey substance or on the accompanying injury to the white matter. The question cannot be decided experimentally, since it is not possible entirely to remove the grey matter without interfering with the white substance. Even if the latter is not mechanically injured, its nutrition is so compromised by the removal of the cortical layer that we cannot possibly suppose its normal action to be unimpaired. All experiments which aim at determining the functions of the grey substance are open to this source of error.

VII. THE LIGHT OF FIRE-FLIES.

THE light emitted by luminous insects has often been the subject of observation and experiment. Recently MM. Aubert and Dubois have obtained some highly interesting results in this direction with a Pyrophorus, which arrived in a living state at Havre in a cargo of wood.

The author first submitted the light of the insect to a spectroscopic examination.

The spectroscope used was an ordinary one with a flint-glass prism of high refractive power and with a micrometer. The insect was fixed opposite the slit, which was illuminated by one of the luminous organs of the prothorax. It is, of course, well known to many of our readers that the Pyrophori have three light-organs; one on the ventral side and the two others on the upper part of the prothorax. The latter, which are always visible, have been used in the experiments in question. The light which they throw off takes a divergent direction to each side of the animal, so that one and the same point cannot be simultaneously illuminated by both organs. Only one of them was, therefore, utilised. The surface to be illuminated was placed perpendicularly to the principal direction of the rays, which make an angle of about 45° with the plane of symmetry of the insect.

The spectrum of the light is very beautiful, but continuous, having neither dark nor brilliant rays.

The spectrum occupied about 75 divisions of the micrometer, extending on the red side up to the middle of the interval which separates the rays A and B in the solar spectrum. On the blue side it reaches a little beyond the ray F.

When the intensity of the light varies its composition changes also in a remarkable manner. When the brightness decreases the red and the range disappear completely, and the spectrum consists merely of the green with a little yellow and blue. The green rays remain longest. The reverse takes place when the insect begins to emit light. The green appears first; then the spectrum extends a little on the blue side and considerably towards the red. The least refrangible rays are, therefore, the last to be emitted. No other source of light is known to behave in a similar manner.

The only case at all similar is that of strontium sulphide, rendered phosphorescent by light and by an increasing temperature. As the temperature rises the less refrangible rays appear in the spectrum, but, at the same time, according to E. Becquerel, the more refrangible rays disappear.

On examining the luminous organs with a little attention, it is found that when the light begins to appear the central and interior portion alone is luminous. It is only when the light becomes very brilliant that it reaches the peripheric stratum in which Robin and Laboulbène have proved the presence of a number of fine oily drops. These savants think that the peripheric stratum does not produce the light, and merely reflects that produced by the central portion of the organ. However this may be, it is curious to remark that the red rays do not appear until this peripheric layer becomes luminous.

The authors have next examined the photo-chemical, or, as the common expression is, the photographic power of the light. Although the spectrum extends but little towards the violet they tried its action upon plates rendered sensitive with the gelatino-bromide of silver. After some fruitless attempts they arrived at satisfactory results. A bit of lace-work of blackened paper was placed before the sensitive plate, which was then exposed to the light of one of the luminous organs placed distinctly above the middle of the design. The other organ sent its rays almost parallel to the plate, which it illuminated a little on one side. The insect was placed at the distance of 0·02 metre from the plate.

By reason of this proximity the illuminated field was of small extent, and scarcely went beyond the borders of the design, save on the side illuminated by the second organ. In order to obtain a decisive result the plate was exposed for an hour, but the action was so intense that a much shorter exposure would evidently have been sufficient. Five minutes were afterwards found sufficient, and the authors think that they could have obtained results in a still shorter time if the death of the specimen had not put an end to the experiments.

The photographs show that the light of the Pyrophorus has a very intense chemical action, especially if we consider that these organs, though brilliant, emit but a very small quantity of light, as was proved by photometric experiments.

The light of the Pyrophorus renders calcium sulphide phosphorescent after five minutes' exposure. The phos-

phorescence is faint, but distinct, and lasts for some time.

On exposure to this light eosine and uranium nitrate become distinctly fluorescent.

No result was obtained with quinine sulphate or an ethereal solution of chlorophyll.

The authors conducted their researches in the Laboratory of Maritime Physiology at Havre, a genuine aquarium; and their results have been laid before the Academy of Sciences.

VIII. NOTES ON *COCCINELLA DISPAR* (COMMON LADYBIRD).

By J. W. SLATER.

THE abundance of this insect during the past summer has given opportunity for a few observations. There have been three successive broods, unless, which is scarcely probable, the adult specimens of the second brood remained alive and active for some three weeks after copulating and depositing their eggs.

These insects seem to be protected by the smell which they give off if bruised, and which to human nostrils is very disagreeable, and of a kind to indicate an equally offensive taste. A single pupa, too, when adhering to the surface of a leaf, has a rather close resemblance to the excrement of a small bird. But being thus, as may be suspected, doubly protected, it is curious that these insects select two very different kinds of situations where to pass their pupa stage. Upon a row of black-currant bushes, where my observations were chiefly made, numbers of pupæ were to be found singly, on the upper surface of the leaves, each generally near a rib or in the depression at the insertion of the footstalk. But about an equal number of the pupæ were to be found on the under surface of the leaves. Here they were collected in groups of from three to eight, and were secured by a few silk threads.

Whether these threads had been spun by the larvæ in the

act of pupation, or whether they were the work of some caterpillar which the ladybirds had devoured, I am not sure.

Against one enemy the pupæ are not protected—the larvæ of their own species. In fact this species—doubtless its congeners also—is of cannibal habits. When a larva in its travels encounters a pupa, moored by its posterior extremity to the leaf, and unable either to fight or flee, it at once seizes the booty from behind. I watched several such cases through a lens, and saw distinctly the mandibles of the larva plunged into the body of its victim and working from side to side. The pupa which is thus being devoured at times raises its head, or moves it from side to side, until its life is extinct. Mr. Billups, one of our most observant entomologists, informs me that he has witnessed similar cases. But as his cannibal specimens were in captivity, he suspected that possibly they might be driven to such an unnatural diet from the exhaustion of the supply of their legitimate prey—Aphides. I am sorry that I cannot give the ladybirds the benefit of this doubt. I observed cases of cannibalism not merely in a small glass box in which I had placed some larvæ, but on the currant bushes where Aphides were swarming. Hence I fear that the *Coccinellæ* are deliberate and habitual cannibals. It is needless to state that this practice must seriously compromise the multiplication of the species, and must especially limit its usefulness as an Aphis-destroyer. Whether this form of cannibalism tends to eliminate the strongest or the weakest members of the species I am unable to say. The destruction falls chiefly upon the progeny of those ladybirds which in each brood are the earliest to deposit their eggs. If such eggs, as I suspect, give rise to the finest specimens, we have here a phenomenon which strongly resembles a survival of the unfittest. I may add that I have never seen a mature *Coccinella* attacking any of the pupæ of its species. This cannot be from mere want of appetite or indifference to food, since the mature specimens prey upon plant-lice no less eagerly than do the larvæ.

When the mature insect first throws off the pupa-skin, its elytra and the upper surface generally are semi-transparent, and of an exceedingly pale amber colour. The design on the thorax is to be seen, but there is no trace of the black spots which afterwards appear, one on each elytron. These are gradually formed in the course of a couple of hours. I have not found that the presence or absence of light made any difference in this process. It would seem, therefore, that there is deposited at the spots in question

not a ready-formed colouring-matter, but what is known among tinctorial chemists as a chromogen,—a substance capable of yielding a colour under some external influence,—here doubtless the oxygen of the atmosphere. To test this supposition I placed leaves to which pupæ were attached in gaseous mixtures free from oxygen, but the specimens died, as I had feared might happen.

I am sorry at having to exhibit an insect so useful to man, and which shares with Cock-Robin the honour of figuring in the nursery-rhymes of most nations, in the odious character of a cannibal. Would that some of our enemies—such as the house-fly, the wireworm, the crane-fly, &c.—would develop the same habit!

IX. THE LUMINOSITY OF *LUCIOLA ITALICA*.

THIS insect, belonging to the family of the Lampyridæ, is very abundant in the neighbourhood of Bologna. S. C. Emery has taken the opportunity of submitting them to a thorough examination, both as regards the anatomical structure of their luminous organs and as to the chemico-physiological process upon which the production and emission of light depend. His observations were much interfered with by the unfavourable character of the weather during the summer of 1883, so that only the anatomical part of his researches can be regarded as completed.

According to his observations, as recorded in the "Zeitschrift für Wissenschaftliche Zoologie," the luminous organs consist of continuous plates, consisting of single lobes in which the terminal ramifications of the tracheæ, the tracheal capillaries, open without communicating with each other.

The male Luciolæ give out light in two distinct modes: in the night, when they are brisk and fly about, the light increases and decreases in short regular intervals, so that it seems to twinkle. If one of them is caught flying, or disturbed in its rest by day, it shines less than at the maximum of its intensity when on the wing, but without intermission. It is remarked, however, that the luminous plates do not

shine uniformly over their whole extent, but that sometimes one spot and sometimes another glows more strongly. If such a specimen is examined under the microscope we perceive, on a dark back-ground, bright luminous rings, which are not, however, uniformly brilliant, but display certain more intense points which flash up and again disappear, or continue to shine on faintly for a time, reappearing afterwards in full splendour. These changes take place without any regular succession.

Signor Emery concludes that the luminous combustion takes place on the surface of the parenchymal cells, but not in their substance. These cells probably secrete the luminiferous matter which is taken up by the terminal tracheal cells, and is burnt by means of the oxygen encountered in the tracheal capillaries. Emery does not consider that the emission of light is a sexual attraction for the females, which are rarer. He suspects that it rather serves to deter insectivorous nocturnal animals.

X. THE INFLUENCE OF MAGNETISM ON THE DEVELOPMENT OF THE EMBRYO.

PROF. CARLO MAGGIORANI has recently read an account of some experiments on this subject before the Academy dei Lincei.

During the process of artificial incubation the author exposed a number of eggs to the influence of powerful magnets. A similar set of eggs, being hatched in the same manner, but kept away from all magnetic action, served as a check. Cases of arrested development were four times more numerous in the first group than in the second. Analogous facts had been previously published in the "Natura" (Florence, 1878). Microscopic examination showed that the sterilisation of these germs was probably due to an intense vascularisation of the yolk-sac.

After the birth of the chickens this increased mortality continued, deaths being three times more numerous in the magnetised group. All the counter-test chickens reached

their full development, whilst of the 114 of the first group 60 presented notable imperfections. Their movements were also abnormal. There were three cases of paralysis and two of contractions.

Six of these chickens arrived at maturity. Of these, two were cocks of a splendid stature, and endowed with an insatiable reproductive appetite. With the four pullets it was quite the contrary. One of them never laid at all, and the three others generally produced merely minute eggs (the heaviest weighing only 30 grms.), without yolks, without germinal spot, and, in a word, sterile.

The magnetic influence upon the embryo is therefore evident, and its action upon the structure and the functions of the germ is still manifest when the latter is arrived at maturity.

May we not, to explain this effect of the magnets, suppose an interference between the magnetic vibrations and the heat vibrations which animate the molecules of the fecundated germ, and impel them towards a new condition of organic equilibrium. This influence generally prevents, and more rarely retards, the development of the embryos (hypertrophy in the two cocks, and atrophy in the four hens), and, as interference implies analogy, may we not infer that the vibrations which impel the germ towards its development are analogous to the magnetic vibrations?

ANALYSES OF BOOKS.

An Introduction to Mental Philosophy on the Inductive Method. With numerous Examination-Papers in Mental Science set in the different Examinations in the London University. By J. D. MORELL, A.M., LL.D. London: W. Stewart and Co.

THIS work, as appears from the very title, is written from a point of view which does not commend itself to our approval. This is shown beyond all doubt in the last paragraph of the Preface. Dr. Morell there writes:—"To render this edition more useful as an Examination Text-book I have asked the aid of a London University graduate, and an experienced tutor, to eliminate from the text what may seem unnecessary or confusing to the student, and to throw the whole into the form suited to the requirements of the London B.A. and other examinations in which psychology is taken as a subject. And to render the book still more useful to students a large number of Examination-Papers have been appended, which papers could not possibly be answered from the contents of any one book, but as many of which could be dealt with directly, or by inference, from this volume as from any other yet published."

Now an "Examination Text-book," whatever ability it may otherwise evince, can only be regarded as the outcome of a radically vicious system, in the main peculiar to England, and the chief cause why—with fair natural capacities, and with a prodigal expenditure of time, labour, and money—we occupy a position in Science inferior to that of certain rival nations.

As regards not a few of the questions in the "Examination-Papers" it might be, for a man of abundant leisure, a curious employment to speculate on the state of mind of the persons putting these questions, on the answers they might expect, and on those they actually received. But for such musings this is not the place.

The author, it will be seen, treats of mental philosophy as a natural science, to be studied on the inductive method. In the very outset of the chapter dealing with the "facts of psychology" it will be seen that Dr Morell's subject in not *general*, but *human*, psychology. He does not begin, *e.g.*, with the simplest manifestations of mind, such as we find them in the lower animals, and trace them upwards to their highest complexity as shown in man, thus following the plan which in physiology has proved so fruitful in important results. There may, perhaps, be grounds

for confining psychological inquiries to our own species. Thus it is impossible for us to look inwards into the mind of the ape, the dog, or the ant, as we do into our own. Nevertheless we incline to the belief that the psychology of the future must ultimately take the new track to which we have referred.

The author recognises a *vital force*, judiciously declining to pronounce, however, whether it is a form of energy or a power *sui generis*. His words are: "What this vital force consists of—whether it be a chemical agency, or magnetic agency, or spiritual agency, or something quite distinct from all the physical or mental forces, and peculiar to organised living bodies—we do not presume to determine." The reader might here feel tempted to ask whether Dr. Morell recognises any other category of agencies distinct both from the physical and the spiritual?

But this vital force is not the only one which the author finds in organised living beings as distinguished from inorganic objects. He admits also a *nerve force* and a *force of mind*. These three agencies he considers as correlated and mutually convertible, yet not identical. We are not sure, however, whether he is not too much inclined to draw sharp distinctions, where persons trained in the biological world see merely a continuous, gradually changing series. At least he does not sufficiently guard himself against being so understood. Thus he states that in the inorganic world there are "no individualities but simple fragments." Yet a crystal is an individual, and so also is one of the pseudo-organisms of G. Fournier. "The tendency to individualisation," he writes, "only becomes perfect in the animal." But here is no sharp boundary-line. There are animals which may, like plants, be multiplied by cuttings.

We are glad to find the author admitting (p. 29) that the division between the vital and the mental is, "after all, arbitrary as far as the real character of the nerve-force which is active in both cases is concerned."

In the third chapter the doctrine of "latency" is very clearly expounded. Heredity is here also fully admitted. He writes:—"The human mind is not a *tabula rasa* upon which experience has to write all the characters. Every individual has his own distinctive type; brings with him into the world mental tendencies and characteristics, derived from his parents and ancestors; possesses vital substrata which operate prior to consciousness altogether; exhibits the working of inward teleological forces which bear the stamp of individuality before the conscious reason is awakened, and impress that stamp thus early upon an organism framed to correspond exactly to the soul of which it is the instrument and the habitation." We note the expression "the conscious reason is *awakened*." Would not "developed" have been a happier expression?

In the fourth chapter, in which Dr. Morell discusses "primordial mental activity and consciousness," we are glad to find him

rejecting certain errors concerning "instinct." He writes:—"It is not an uncommon idea to contrast instinct and reason, as though they were opposite in their nature and the one excluded the other. The real fact of the case is that, so far from being opposites, they are fundamentally identical. Instinct is reason, but reason in its undeveloped, semi-unconscious, and wholly voluntary form." He goes on, however:—"The primordial instincts we have just referred to (*e.g.*, the tendency of the new-born baby to suck) are the first efforts of reason to awaken from its slumber, and to commence a new and conscious life in connection with the higher organism which *human nature* presents." Has reason then existed before the organism, and has it passed an unconscious life in connection with some lower organism?

In his fifth chapter the author reviews the materialistic hypothesis, to which he opposes the two following arguments:—

"That no one knows what matter is, so that when we have succeeded in reducing mind to matter we are really no nearer to any valid solution of the difficulty of the case than we were before. Matter, after all, may perhaps be reducible to force (energy), and force to spirit, as its source and spring."

To this contention the materialist might reply that an analysis by which the two supposed substantive entities, mind and matter, should be reduced into one, would be a distinct gain, even if the remaining one were still an unknown quantity. To take a parallel case, if the three halogens, chlorine, bromine, and iodine, were all found to be reducible to one, chemists would experience lively satisfaction, even though the origin and ultimate nature of that one should remain inscrutable.

The second argument is much more weighty:—"That the material forces from which mind is supposed to emanate are, as far as all our experience goes, uniform and constant in their operations, while in every single mind we have a separate and distinct individuality. How any combination of chemical, electrical, or other physical forces, passing through any conceivable kind of organic instrumentality, could result in the infinite variations of human individuality is quite beyond our power of conception, and is alone sufficient to stamp Materialism as inadequate to sum up the facts of the case intelligibly into a scientific formula."

Another theory brought forward—we remark in passing that the author does not, in some cases at least, distinguish between "hypothesis" and "theory"—is that which regards mind as a "special manifestation of the Absolute thought." This, also, the author sets aside as incapable of accounting for the facts of individuality.

The ordinary dualistic theory views mind and body as "two wholly distinct existences with a temporary and partial connection, but still carrying on their respective functions quite independently of each other." This supposition, also, is inadequate.

Dr. Morell himself inclines to the "doctrine of Individualism, according to which every man [and if every man, why not every animal?] is made up of two elements, material and spiritual, which completely inter-penetrate each other. Body and mind here stand to each other in the relation of matter and form."

This doctrine, of course, does not lend itself to the familiar conception that the body is the house or dwelling of the soul. Nor is it easy to see how it, rather than the materialist view, accounts for the vast variety in individuals.

We regret that we cannot, for the present at least, pursue further our examination of this interesting work. Within the compass selected, and under the conditions which the author has set for himself, *viz.*, of producing an examinational text-book, and of dealing with the human mind out of connection with the minds of the lower animals, it may be pronounced a most valuable treatise.

On Insanity and Nervous Disorders peculiar to Women in some of their Medical and Medico-Legal Aspects. By THOMAS MORE-MADDEN, M.D., F.R.C.S.E. Dublin: Fannin and Co.

THIS small work raises some great and grave questions. There is, firstly, the subject of our lunacy laws and the desirability of their reform. At present it appears that any two medical men, not necessarily of eminence or long experience, not necessarily such as have made a special study of brain diseases, may by their certificate—which is practically a *lettre de cachet*—doom any man or woman to indefinite confinement in a lunatic asylum. Of this a very painful instance has been lately recorded in the columns of "Light." The victim in this case was perhaps slightly eccentric, but he was perfectly capable of looking after his own affairs, and was neither a source of danger to himself nor to the public. Yet the lunacy laws of England enabled an unfaithful wife to have him incarcerated. He was, indeed, soon released, but in the meantime the woman had disposed of all his property at a ruinous sacrifice and gone abroad! Dr. More-Madden proposes that in future "certificates of insanity should be given only by specially appointed Medical Inspectors of Lunatics; that private asylums should be abolished as such; and that all patients in asylums should be treated by extern or visiting physicians."

Another serious matter here touched upon is the increase of insanity in "this our highly-favoured country." In England and Wales it appears that within the last thirty-five years the number of registered lunatics has risen from 1 in 800 to 1 in 352. In

Scotland and Ireland the increase is similarly alarming. This fact is even more serious than it appears at first glance. If we find a certain number of deaths recorded as having happened in a battle, an explosion, or a railway collision, we know at once that the amount of the persons wounded or mutilated will be, under average circumstances, much greater. Just so here: if out of every 352 persons there is one decided lunatic, we may be quite sure that there will be two or three persons weak-minded, given to delusions, or easily led by impostors and quacks of all kinds. Is this not so?

Dr. More-Madden does not enter into the general causes of this increase of insanity. But if we ask ourselves in what has there been the greatest change during the last thirty-five years, there can be but one answer—the increase of worry and anxiety. Part of this is due to intensified competition in trades and professions; part to the examinational Anglo-Chinese system of education which we inflict upon the young, the mischief of which appears chiefly in after-life, or in the next generation.

Dr. More-Madden notes, as an especially alarming feature of the times, the increase of female lunatics. "Formerly insanity was more frequent in the male sex, who, from their habits and occupations, were more exposed to the exciting causes of mental disease; now, on the contrary, the increase of lunacy is even more marked in women than in men."

Among the causes of this change he enumerates "the misdirected or neglected mental and moral training too prevalent in the education of female youth [May we not add the foolish disposition of the heads of boarding-schools to consider health as something 'rude' and 'vulgar'?]; secondly, the undue stimulation of the reproductive functions; and thirdly, the general and increasing tendency to alcoholism in women as well as in men." This alcoholism, we must not forget, is one of the by-products of worry. But there is more to follow:—"Now-a-days women are not only liable to those special causes of nervous disorders which arise from utero-ovarian irritation, but in too many cases they voluntarily expose themselves to all the accidental causes of insanity to which men alone were formerly subject. This is one result of that hopeless contest with Nature in which they are engaged who seek to unsex themselves by assuming all those masculine privileges and modes of life which are too dearly purchased at the expense of that increased tendency to cerebro-nervous disorder by which, in such cases, outraged Nature avenges her violated laws." Too true!

Vaccination. By ALEXANDER WHEELER. London: E. W. Allen.

THE Anti-vaccinationists, like "anti" people generally, cannot be accused of inactivity. Although some prophets of their own have suffered in their persons and their families from the present epidemic, they by no means relax in their efforts. The author of the present pamphlet spends a very large proportion of his space in endeavouring to prove that smallpox is not "the most destructive or terrible English disease." He writes:—"The Committee (Parliamentary) of 1871 tell us that it was the most terrible of diseases." But if we turn to the very words of the Committee, as quoted by himself on the first page of his pamphlet, we read—"Smallpox is one of the most terrible and destructive of diseases." This seems to us a very different proposition from the one which Mr. Wheeler undertakes to refute. He tells us that "the years of greatest mortality are those of the least extension of smallpox," and he complains that "the exhibition of this fact has stupidly led some to charge us with fondness for smallpox." But supposing this is true,—supposing that during epidemics of smallpox the gross mortality is greatest, and that when it is absent such mortality is least,—we submit that this is nothing to the purpose. It can prove nothing as to the efficacy or inefficacy of vaccination, and is therefore altogether out of place.

We must further remind him that the terribleness of smallpox cannot be measured by death-rates. We have no statistics of blindness and disfigurement—the former certainly an evil worse than death, both to the individual affected and the community. Nor is disfigurement a trifling evil. We speak advisedly when we say that a pitted face is no trifling hindrance to persons of either sex in quest of employment. Again, an attack of smallpox not merely causes the patient himself to lose his situation, but it has often the same effect on other inmates of the house. Surely, in face of such indisputable facts, smallpox may well be called one of the most "terrible diseases," and whether the years of least smallpox have more deaths than the years of most smallpox or not is a somewhat frivolous question.

We must also take exception to the following:—"Till the rite (vaccination) is in abeyance we cannot tell certainly if we cannot control smallpox by sanitation equally with other diseases." The facts of the case surely prove that we cannot. The author contends that smallpox is little changed. He writes "that smallpox has decreased in prevalence, but that is a feature common to it and other diseases; and that other diseases have much exceeded it in severity, and yet also in decline, in consequence of sanitation." Well, then, if vaccination *plus* sanitation has

effected but a relatively small decline in variola, will a greater decline be effected by sanitation alone?

We cannot believe Mr. Wheeler when he says that the absurd trust in the Jennerian rite leads to "recklessness and foolish exposure." Our observation tells us that the vaccinated and the unvaccinated alike shun any person whom they suspect of having been in contact with a smallpox patient, or of coming from a house where the disease exists or has lately existed. It seems to us that most people err rather by exaggerated caution than by over confidence.

We think that the fairest way of ascertaining the value of vaccination as a prophylactic would be for the present agitation to be suspended. If the entire community were duly vaccinated, and if smallpox epidemics still occurred, we should then be warranted in questioning the value of the "rite." We fear the basis of the anti-vaccination "movement" is not medical, but political. There are people, we fear, who consider themselves entitled to cherish diseases if they feel so inclined, and who regard vaccination, however efficacious, as an inroad on their "liberties."

Proceedings of the Bristol Naturalists' Society. New Series, Vol. IV., Part 2 (1883-4). Bristol: James Fawn and Son.

This issue contains a continuation of Mr. A. E. Hudd's Catalogue of the Lepidoptera of the Bristol District. Here we find mention of the disappearance of *Solenobia pomonæ*, formerly plentiful. It appears that hundreds of specimens bred by the author, by Mr. Harding, and Mr. Vaughan were all apterous females, not a single male having appeared during several years. *Depressaria pallorella*, formerly common near Bristol, has become scarce. Of *Œcophora pseudospretella* we find it recorded that Mr. Vaughan bred a series of specimens from a wax-candle —a fact which opens up some difficult questions in chemical physiology.

The butterflies of the Bristol district—55 species—include all those recorded by Mr. Barrett for Norfolk, and in addition *P. daplidice*, *L. sibylla*, *L. arion*, *L. adonis*, *N. lucina*, and *H. comma*. Of the Nocturni, Bristol has 73 species as against 74 in Norfolk, and of Noctuæ 215 against 225. No fewer than 35 of the Norfolk Noctuæ have not been seen in the Bristol district, which, on the other hand, has 27 species not recorded by Mr. Barrett. The total number of species of Lepidoptera recorded for Yorkshire is 1341, for the Bristol District 1310, and for Norfolk 1246.

Mr. James W. White contributes a paper on the "Flora of the Avon Bed." A disused limestone quarry had been filled up with matter dredged from the bed of the Avon and the floor of the docks. On this rubbish there sprung up a great variety of plants, some of which had formerly been known to grow in the Avon Valley, but which had become extinct. The author concludes that these plants were due to seeds which had been buried in and had been dredged up with the mud of the Avon.

"Report on Wells sunk at Locking, Somerset, to test the Alleged Power of the Divining Rod," by Prof. W. J. Sollas, D.Sc. This paper is reprinted, with additions, from the "Journal of the Society for Psychical Research." The conclusions of the paper are adverse to the pretensions of the rhabdomant, or "dowser." This man maintained that at the critical moment the dowsing-rod turned of itself, without any pressure being exerted by the fingers. But both Prof. Sollas and Dr. Burder are positive that every time the rod turned they discovered a corresponding movement in the fingers of the dowser.

Mr. Cedric Bucknall continues his Catalogue of the Fungi of the Bristol District, and Mr. J. W. White resumes the Flora of the Bristol Coal-field.

Twelfth Annual Report of the United States Geological and Geographical Survey of the Territories. A Report of Progress of the Exploration in Wyoming and Idaho, for the Year 1878. Part II. By F. V. Hayden, United States Geologist. Washington: Government Printing Office.

This goodly volume contains, in the first place, an account of the Geology of the Yellowstone National Park. This tract of land, which is for ever set apart for the benefit of the public, and guaranteed against all encroachment, is 55 by 65 miles across. The entire area is from 6000 feet or more above the sea-level. Hence, as might be expected, the climate is rigorous, not a single month of the year being free from frost. Its geological features, both in form and colour, attract the wonder even of non-scientific men, and its hot springs and geysers are absolutely unequalled.

These geysers form the subject of a special report, by Dr. A. C. Peale, which occupies the greater portion of the volume. Of the geysers three—the Giant, the Castle, and the Grand—are calculated to reach the height of 200 feet; one, the Bee-hive, of 219; and one, the Giantess, of 250.

By way of comparison an account is given of the geysers of Iceland and of New Zealand. The height reached by the Great

geyser of Iceland seems to vary much on different occasions. The highest actual measurement given is 212 feet, but as seen by Olafsen and Povelson it was estimated at 360 feet; and Mr. R. Allen says that well-informed natives do not consider it at all improbable that such a height might be reached. Strokhr, which is only about 120 yards from the Great Geyser, does not reach so great elevations, the highest measurement being only 132 feet. The Roarer, once equal to the Great Geyser, diminished since the earthquake of 1789, and has ceased to spout.

It is remarked that the springs in the Yellowstone Park generally present shades of blue, shading sometimes into green. The same colours are found in Iceland, Java, New Zealand,—in fact in every region of hot springs. Many lakes and rivers also, in Switzerland, California, and Norway, have a more or less decided blue shade. Pure water is, in fact, distinctly blue if seen in a sufficient depth, though in ordinary streams and pools this colour is annulled by the brown shade due to decomposing organic matter.

The volume is profusely illustrated, and the views convey striking instances of the gorgeous, yet at the same time weird, character of the scenery.

Canal and Culvert Tables, with Explanatory Text and Examples. Revised Edition, with Additional Tables. By Lewis D'A. Jackson, C.E. London: W. H. Allen and Co.

The current of events is directing public attention much more strongly to canals than has been the case for the last half-century. We are beginning, now the gloss of novelty is worn off, to perceive that railways—however necessary for the rapid conveyance of passengers, of the mail-bags, and of perishable goods—cannot, as far as ordinary heavy merchandise is concerned, compete in price with canals. Men of business are, therefore, awaking to the truth that our recent neglect of the facilities for inland navigation has been a mistake. It is seen that by the application of steam to boats, on properly constructed canals, an average rate of speed can be reached fully equal to that of a goods' train, with the advantages of easier rates, and of delivery and collection at almost any point in the country traversed.

Hence we think that Mr. Jackson does himself and his subject less than justice when he says, in his Preface, that "the portions applicable to culverts perhaps alone being likely to come into frequent use in England."

The author refers to two recent series of observations in hydraulics,—the one a series of velocity observations made for the Government of India on the Ganges Canal. These observations "clearly disprove the accuracy of the old hydraulic formulæ for flow under gravity, and corroborate the positions laid down by the author in his first edition. The other set of observations referred to were conducted by Mr. Baldwin Latham on the tidal portions of the Thames, at the instance of the Corporation of London. The results of these observations, however, have not yet been made public.

Mr. Jackson finds it necessary to point out expressly that his tables for canals and culverts are not intended to apply to rivers of any sort, more especially the tidal.

The second edition before us has been carefully revised, and certain errors, both of calculation and of topography, have been eliminated. Additional tables have been added to the extent of forty pages.

That the work will prove directly beneficial to the engineering profession, and indirectly to all interested in drainage and the supply of water, as well as in internal navigation, is self-evident.

Hay-Fever; its Etiology and Treatment. A Lecture delivered at the London Hospital Medical College. (Reprinted from the "British Medical Journal." By MORELL MACKENZIE, M.D. London: J. and A. Churchill.

HAY-FEVER is a fashionable disease of the day, and, although we never came across any person affected by it, it would be idle, as do some, to doubt its existence. Dr. Mackenzie considers that the disease has of late years increased in frequency, and thinks it probable that irritating properties have been newly acquired by certain vegetable bodies. Such a change is by no means out of the question. But it cannot be overlooked that the disease is most common in two countries differing widely in climate and in flora, but both inhabited by a race given to over-work and mental tension under pressure. The two countries are, of course, England and the United States. The late Dr. G. M. Beard ranked hay-fever among the neuroses, though the pollen of grasses, &c., may be one of the principal exciting causes,—perhaps *the* principal. Dr. Mackenzie admits that out of millions of people, exposed alike to inhale the pollen of flowers, very few suffer. The liability appears suddenly, but when once acquired it is seldom lost, and the predisposition seems to increase with each succeeding season. The author states that it is rare on the Continent of Europe. In Asia and Africa it attacks only the English.

In America it occurs in every State, but diminishes in frequency towards the south. In Britain the contrary rule seems to prevail, since it is most common in the south of England and very rare in the north of Scotland. In New York, where the disease is relatively common, it is unknown among persons of German or of French descent, as well as among Indians and Negroes. A singular feature is that this complaint seems most prevalent among "persons of some education and of fair social position."

Dr. Mackenzie decidedly recognises pollen, especially that of the grasses, as the general exciting cause. He adds:—"It need scarcely be said that zealous 'bacteriomaniacs' have, of course, sought for parasitic germs in the nasal secretions of those subject to hay-fever; but although bodies resembling pollen-corpuscles have been found, no specific organisms have, so far as I am aware, been detected. It is almost a comfort in these days to find one disease for which the ubiquitous bacillus does not appear to be responsible."

Into the proposed methods for the treatment of the disease we can the less enter as they are none of them considered satisfactory.

Our Corner. Vol. IV., No. 3. September, 1884.

This issue contains but little matter of which we can legitimately take cognizance. There is an interesting account of a fishing expedition in the Western Islands, by Mr. Charles Bradlaugh, M.P. He appears to have appreciated, and to have been in turn appreciated by, the midges, of which there were millions at Loch Long. These malevolent little insects seem to prefer strangers to natives. At least so we should infer from the passage—"In the Western Highlands of Scotland men and women who come from the south are distinguished from the natives by midge marks." We should advise all persons exposed to the attacks of these wretches to anoint themselves with tincture of marsh-rosemary.

"Witches and Witchcraft," by Hypatia Bradlaugh, is a study of a very delicate subject,—much more difficult to deal with than was the case half a century ago. It is manifest that had Mr. Eglinton lived in the times of sapient King James I., or of Cromwell, he would have suffered as a sorcerer.

"The House Fly" is one of a clever series of papers on our "Household Pests," by Mr. J. Horner. It seems to us, however, that he exaggerates the scavenging services of the Diptera. Certain beetles, such as the Geotrupidæ and the Necrophaga, are true or genuine scavengers, since they prey upon carrion and

ordure alone. The flies, on the other hand, settle first upon putrescent matter, and then upon our food or our persons, carrying with them the germs of decomposition and disease. It is all but absolutely demonstrated that they are the chief agents in the propagation of pestilence. The fluids of their bodies, elaborated from decomposing animal matter, are entirely malignant, and being introduced into the bodies of the men and other animals bitten, set up a series of effects which range from the irritation springing from the puncture of a gnat or a midge to deadly carbuncle.

Mr. Horner writes:—"Man, in his cruel ingenuity, has enticed the insect tribes into his service in order to inflict torture upon his fellows." It may perhaps be news to some of our readers to learn that in Eastern Europe, in the olden time, a serf who had offended his lord was sometimes stripped naked and left bound to a tree in some swampy forest, where the mosquitoes tormented him to death.

The "Story of Giordano Bruno" comes to its conclusion, infinitely sad, but not the less glorious.

Longman's Magazine. No. 22, August, 1884. London: Longmans and Co.

THE only paper in this issue which can at all come under our cognizance is one by Mr. R. Proctor, on "Earthquakes in England." The author gives a notice of the earthquakes, historical or traditional, which have from time to time shaken this island. Most of these have been of an exceedingly mild character, though we have no direct guarantee that we may never experience a more violent shock. Mr. Proctor's theory is that "every earthquake indicates the continuance of the process of contraction which every orb in space undergoes till it has reached its final condition."

No. 23. September, 1884.

"THE Chase of the Wild Red Deer" may suggest a variety of reflections even to those who, like ourselves, feel an exceedingly slight interest in "sport" of any kind, It is surely strange that a people so reckless of animal suffering in pursuit of amusement should be intolerant of a—generally—smaller amount of pain in putsuit of physiological knowledge. We must, however, frankly own that the chase of the wild red deer is a much more creditable affair than the pursuit of a fat, timid, half-domestic animal,

brought in a cart to be hunted by the buckhounds of a certain illustrious lady.

The Index. Vol. V. New Series, No. 6.

THIS paper, whose praise is *not* "in all the churches," has been forwarded to us with especial reference to an essay entitled the "Religious Confession of an Evolutionist," by Charles Froebel. This memoir is not exactly what we should have anticipated from the title. The writer discusses, calmly and thoughtfully, the "true relation of religion to science, metaphysics, and æsthetics in human nature." He recognises four fundamental phases of psychical life:—"Religion, the infinite synthetical phase; Metaphysics, the infinite analytical phase; Æsthetics, the finite synthetical phase; and Science, the finite analytical phase." Each of these phases, we learn, may evidently appear either in a receptive or expressive mood.

In a following section the author examines the "duties of Religion and Science." We transcribe the following passage as illustrative of the author's point of view:—"For just so long as she (Religion) endeavours indiscriminately to maintain possessions to which she has no title, as well as those to which she has, her efforts will be so enfeebled by the extent of the psychical territories she seeks to control that she will find herself despoiled of everything, till she is poor indeed,—in fact, no religion at all, but the mere dethroned claimant of a metaphysically-garrisoned dependency of Science. To avoid this disaster, Religion must acknowledge her limitations. She must admit that while she claims as her legitimate inheritance that region which Science terms the 'unknowable,' yet the forms dwelling in this region are for her no more knowable than for Science. She must acknowledge that on this field not Science only, but she as well is agnostic,—unable to know. For it is in the form of *belief*, and not in that *knowledge*, that she must and can maintain her rights. To the charge of Science 'You do not know!' she must reply 'My cognition springs from sources of higher authority: I believe!' When Science insists that she has no tangible reasons for her belief, she must answer that she has more tangible wants, affections, and desires. And when she occupies that position Religion will no longer be vulnerable. Like the wonderful shadowy form of some Oriental tale, the arrows of Science will pass through, her leaving no wound; the sword of Reason may seem to cleave her, but she will stand there still unharmed,—the eternal, the mysterious, the all-beautiful!"

Science, on the other hand, "must demonstrate to the church-

man not only to what *external* laws of the great analytical power of thought he must *conform* his creed, but also what *internal* laws of the equally great synthetic power of feeling must *inform* his system of beliefs, if he would desire it further to dominate mankind."

A third section is devoted to the "Relation of the Evolutionist to Ultimate Religious Parties." The author quotes here the lines—

> "Diess ist der Jugend edelster Beruf,
> Die Welt, sie war nicht, eh' ich sie erschuf."

Who, by the way, can fail to find here the very essence of "Hylo-Idealism"? The author writes further:—"Regarding the thesis of Evolution as the very soul and essence of modern scientific thought, it is plain that the mind which projects it has a Pantheistic bent, and that either the lens of this thesis must be broken or that only those religious forms which are synrhythmic with its ideas can live within the intense heat and light of its focus. Of all the forms now prevailing in Europe and America but four—Atheism, Spiritualism, Buddhism, and Unitarian Pantheism—deserve our consideration."

Concerning Spiritualism Mr. Froebel writes:—"Probably no other phase of modern religious development is more deserving of philosophic analysis and interpretation."

A paper on "Work and Rest," by W. J. Potter, contains much which we cannot recognise. He holds out small hopes for the future. He scarcely sees that "work" is not merely exertion dictated by necessity or by greed, and leading to material rewards. He writes:—"Work will doubtless become more equalised among different classes of society as the world progresses, and some species of drudgery it may be hoped may be abolished by improved facilities and methods. . . . The leisure that is wanted is only leisure from excess of hard physical toil!" Alas for "progress," if this is all! "Some of the newspapers have recently reported the sad fate to which a number of wealthy young men of good families in New York have, in recent years, been brought through the misfortune of having nothing to do." Very probable; because education and public opinion had trained these young men in the belief that money-making in one form or other is the only occupation, the only work, all other pursuits being alike idleness. But wealthy young men who rise above this vulgar error become the Darwins, the Lyells, the Goethes, the Buffons. If we want progress we must have increased leisure,—leisure not merely from hard physical toil, but from mental toil in the service of greed. And to this end we must go in for plainer living, which alone can make higher thinking possible.

The "Cost of my Orange," by Mr. W. D. Gunning, is an instructive study in Evolution. We can quote merely the

concluding passage :—" If the religion makers of the race had been tillers of the soil and growers of fruit, all religions would have been what Buddhism is—Pessimistic."

The " electric girls " of the Southern States do not meet with credence. " It has been sufficiently shown that when the Georgia wonder—Lulu Hurst—encounters a trained athlete who is stronger than herself and equally quick, neither odic force nor the spirit of her grandmother has the slightest effect upon him."

" The Index " evidently contains much that deserves careful reading.

On the Observations of Earth-shakes or Tremors in order to Foretell the Issue of Sudden Outbursts of Fire-damp. By M. Walton Brown. Newcastle-upon-Tyne: Andrew Reid.

In this pamphlet, which is a reprint from the " Proceedings of the North of England Institute of Mining and Mechanical Engineers," we find arguments in favour of the very probable theory that sudden outbursts of gases may be occasioned by slight tremors of the earth's crust. That such motions occur, and that with considerable frequency, does not require any demonstration; and that the gas liberated in coal-beds will be for the most part fire-damp may also be at once admitted.

The theory, it appears, was first broached by Mr. W. L. Wharton as far back as 1845, by occasion of a curious escape of gas which he observed taking place from the bed of the river Wear. He writes :—" A line of streams of gas was observed crossing the Wear diagonally in the direction N.N.E. and S.S.W. under the Framwellgate Bridge and for a length of about 100 yards. When the air and water were perfectly calm large bubbles formed by the ascent of gas, and taking fire at a lighted candle, marked the limits of the streams of gas above the bridge, and two other smaller groups of bubbles were seen below the bridge. It is believed that there are no coal-workings or excavations of any kind within several hundred yards of Framwellgate Bridge, and the escape of gas must be attributed to some extensive natural accumulation." For its sudden liberation, as described, scarcely any theory is conceivable except the formation of a chink or fissure in the bed of the river by some subterranean movement or vibration. It is hence exceedingly probable that in the coal-fields outbursts of gas may occur along lines of faults.

Transactions of the New York Academy of Sciences. Vol. II. Nos. 1 to 13.

On October 9, 1882, a discussion took place on Mr. F. C. Whitehouse's paper maintaining the artificial character of Fingal's Cave. Considerable difference of opinion occurred, Prof. E. H. Day opposing the hypothesis of Mr. Whitehouse, and the President pointing out the absence of detritus on the shore, and noting the fact that the approaches to the Staffa Caves are over low flat ground, furrowed by canals leading up to their entrances, as if artificially excavated.

On November 20 the Rev. H. C. Hovey delivered a very interesting lecture on "Subterranean Scenery." The lecturer classified caves as volcanic, such as those of Cumana and Iceland; marine, of which the Grotto Azuro, of Capri, and the caverns of Staffa are examples, and inland caves in non-volcanic districts, especially in limestone rocks. A particular description was given of the Luray Cave in Virginia. Such caves,—and the same rule applies to those of Castleton, Adelsbach, &c.—though sometimes ascribed to earthquakes, are really due to the chemical and mechanical action of water. "Acidulated water cuts into the limestone, searching out the lines of weakness, until channels are made leading down to some subterranean outlet. The agency of running streams carries on the work begun by water charged with carbonic acid. Sand and gravel borne in with these streams make of them powerful cutting-engines."

On November 27 Dr. J. S. Phene in a paper on the Mound-Builders argued that they were contemporaneous with the ancient horse and with certain members of the elephant family. As to the camel the evidence is not conclusive.

In a discussion on the physical conditions under which coal is formed Dr. Newberry stated that in passing through the coal-measures from below upwards differences in the flora were traced, but the types were largely interlocked by insensible changes. The *Sigillaria* is abundant below, and as we pass upwards it decreases and disappears.

On January 22, 1883, Prof. Thwing read a paper on the "Treatment of Sea-sickness by the Trance State," induced, it would seem, by mesmerism. The author's experiments confirm the theory of the late Dr. G. M. Beard that the concentration of attention in one direction induces an insensibility to other things, more or less complete.

At the meeting on February 5, 1883, occurred an incident which seems strange to Englishmen of the present day. A resolution, namely, was passed that "The New York Academy of Sciences endorse a petition for Congress to remove all duties on specimens of minerals and fossils, whether imported by dealers,

or by institutions of learning, or by private collectors, so long as they are intended for cabinet specimens and not for use in the arts." Alas that such a petition should be necessary!

Mr. Romyn Hitchcock read a paper on the alleged reticulate structure of bioplasm (protoplasm or bioplasm), which he controverted. In the discussion which followed, Mr. A. H. Elliott referred to the experiments of Mr. Crookes on radiant matter, and enquired whether there were any means of explanation of the motions of the granules of living matter analogous to the molecular motion observed by that investigator. Dr. Schœney remarked that mere molecular motions were simply helped or retarded by the different physical forces, but that the agencies concerned in the phenomena of life were quite different from the other cosmic forces. Mr. Hitchcock observed that it had been suggested, in regard to the distinction between living and non-living matter, that they may differ in the same way as in inorganic bodies—atoms of the same substance are subject to different arrangements—one mode of arrangement being peculiar to living matter.

In a discussion on the determination of organic matter in potable water it was remarked that the water of the Dismal Swamp was dark in colour and teeming with organic matter and yet was not unhealthful.

On June 4th, Dr. J. S. Newberry read a paper among other things disproving the theory—adopted by some English savants—that an ice-epoch must have been a warmer period than at present, with more copious precipitation.

Papers and Proceedings of the Royal Society of Tasmania for 1882. Hobart: "Mercury" Office.

In the "Proceedings" we find the usual climatological notes. The winter seems to have been severe for the latitude. During July (16th) snow fell at Hobart to the depth of 2 to 3 inches. On August 26th another snowstorm occurred, and on July 29th the minimum temperature registered was 21° F.! Even in October, when the horse-chestnuts were in flower and the vines budding, we find mention of flakes of snow.

The principal paper inserted is entitled "General and Critical Observations on the Fishes of Tasmania," by R. M. Johnston, F.L.S. The author enumerates 190 species of fish as occurring in Tasmania.

It is remarked that since the use of seine-nets in the Derwent

above Hobart has been prohibited all fish have rapidly increased in number, size, and quality. It is affirmed that more fish are now caught with rod and line than were formerly obtained by netting.

The introduction of the salmon and the trout into the Tasmanian rivers has proved successful. The acclimatisation of the European herring in the Antarctic Seas is now contemplated.

Mr. R. Etheridge, F.G.S., communicates a description of Trilobites from the Lower Silurian of the Mersey district in Tasmania.

Mr. James Barnard discusses the economic value of *Typha latifolia*. This aquatic plant is used in Italy as a stuffing for buoyant mattresses, cushions, &c. Such mattresses are used on board the Italian navy as a life-saving appliance, one of them being easily capable of supporting two persons in the water. Signor C. A. de Goyzueta, Italian Consul at Melbourne, called the attention of the local Australian Governments to the valuable properties of this plant, and its acclimatisation is in progress. Meantime attention has been drawn to a kindred species, *Typha angustifolia*, indigenous in the marshes of Tasmania, and possessing the same physical properties. The writer justly remarks that cushions stuffed with this plant would often prove the means of saving valuable lives in the capsizing and foundering of river-craft, coasters, &c.

Lieut. C. E. Beddome furnishes a description of some new marine shells of Tasmania.

R. M. Johnston, F.L.S., gives a note on *Olinus despicallatus* and *Boviethys variegatus*, two viviparous fishes.

Messrs. E. T. Higgins, M.R.C.S., and W. F. Petterd, C.M.Z.S., communicate accounts of hitherto undescribed Antechini and Muridæ inhabiting Tasmania.

We regret to learn from the appended Report that both the Botanical Gardens and the Museum are crippled from want of funds.

Papers and Proceedings of the Royal Society of Tasmania for 1883. Hobart: "Mercury" Office.

Among the principal papers here inserted is one by E. T. Higgins and W. F. Petterd, on a new Cave-Spider (*Theridion troglodytes*). This species, the female of which measures 6½ inches from the claw of the anterior to the claw of the pos.

terior leg, is found in a cave in the Chudleigh district. The nest is of the size of a large pigeon's egg. Curiously enough there have been, so far, no insects discovered in the cave on which these spiders could subsist. Several species of mammalian remains have been found agglutinated to the rock by stalactitic incrustations. No carnivorous marsupials have been found. The stalactites of the cave are said to be magnificent.

Mr. F. Abbott, Superintendent of the Royal Society's Gardens, communicates notes on new plants introduced during the season. Prominent among these is the Georgia pitch pine.

A number of rhododendrons and azaleas have been introduced from India, Java, Japan, &c., and will doubtless spread on the sandy and peaty soils of the island.

Dira grandiflora, a splendid terrestrial orchid, native only on the summit of the Table Mountain, has, after many trials, been successfully introduced.

The introduction of new fruit trees has been practically brought to an end for want of room and funds. The writer justly remarks that the task of maintaining and extending such a collection belongs rather to a Horticultural Society than to the Royal Society.

The Museum of the Society continues to receive donations of a very promiscuous nature. We hope that the funds of the Society may suffice for the reception and classification of the specimens, which otherwise will be of little good to Science.

A Mr. Dyer calls attention to a large harmless lizard (*Cyclodus nigrolutens*), which in Tasmania has unfortunately received the name of the "death-adder," and is hunted down in consequence. So far from being injurious to man, it attacks and destroys poisonous serpents in their youth, and therefore justly deserves protection instead of persecution.

We find mention of the after-glow in the western skies, for an hour or two after sunset, as having been observed in the latter part of October.

Two specimens of *Sphinx Convolvuli*, captured in the island, were presented to the Museum by Mrs. Lodder. This species is probably becoming cosmopolitan. We have received specimens of it from the Transvaal and Zulu-land.

Bulletin of the California Academy of Sciences. No. 1. February, 1884.

THIS number contains a description of a new species of *Squalius*, by Rosa Smith; a description of a number of new plants, some of which, we regret to find, have been fitted out with a Latin "diagnosis." What apology can be urged for this "survival" we must own ourselves unable to see. New chemical compounds, new physical facts, are not in our days described in a dead language which has the disadvantage of not affording an accurate nomenclature for colours. Why, then, should this antiquated custom be retained for new botanical or entomological species?

The Microscopic Section comprises an enumeration of the Fungi of the Pacific Coast and of California.

The Proceedings of the Astronomical Section contain nothing of marked interest.

CORRESPONDENCE.

*** The Editor does not hold himself responsible for statements of facts or opinions expressed in Correspondence, or in Articles bearing the signature of their respective authors.

HYLOZOISM AND HYLO-IDEALISM.

Absence abroad has prevented my seeing Mr. Billing's late lucubrations on this subject, which are really quite beside the question, in the "Journal of Science," until now. Might I ask, if not too late, that you will kindly allow me space in the October number of your fearless Journal to state, necessarily in the shortest terms, what the *Brain Theory of Mind and Matter* really is, Mr. Billing having already very successfully shown what it is not? C. N., who is a young Collegian, will probably answer more elaborately his mystifications on her return, in October, from Germany.

The aim of Hylo-Idealism, or Auto-Centricism, for it has a hundred other names, is, in the most summary and conclusive way, to abolish the biblical, theological, supernatural, animistic or dualistic system of the World,—*i.e.*, of Life and Mind,—by substituting the scientific, medical, monistic, hyloic, or hylo-phenomenal theory of "things" for that out-worn hypothesis. And it does this by proving, on *data* so very clear now-a-days, that "all who run may read," if they care to do so, that all "things" or "nothings" to which we have access, whether abstract or concrete, can have only a phenomenal or cerebral origin as conceptions or perceptions,—*i.e.*, as objects of sense or thought, which surely are only faculties or functions of the Brain. Man *must* therefore anthropomorphise and *auto*morphise from the very nature of his being,—a truth which unifies subject and object, Ego and Non-Ego, Self and Not-Self, making thus the whole universe intercranial as the creature of sight (sense) and thought. Light itself is not light till manufactured in the posterior chambers of the eye, "which is the only colour box." All Divine Worship or Religion *must* be thus Self-worship, as out of Self Self can never escape, what is outside that sphere being nothing to us according to the immemorial proverbs:—*Quod supra, vel extra nos, nihil ad nos,* and *De non apparentibus et non existentibus eadem est ratio.* Science, and especially

Philosophical Medicine, has in all ages, with more or less certainty, always postulated this hylo-phenomenalism, which in our days is placed quite beyond dispute by the materialistic principles of Bichat's and Hunter's histology, accepted as the only basis of all contemporary sound Physiology, Pathology, and Therapeutics. To Medicine, and not to Mathematics, Metaphysics, or Theology, really belong the "great problems" of Life, Disease, and Death. On these data Hygiene, or supreme culture of body and mind, which latter is only a bodily function, becomes the substitute for Religion or Divine Worship, thus eliminated from reality not merely as a baseless, useless, and mischievous chimæra, but as an *absolute impossibility*. Sir W. Gull posits these same conclusions in his Harveian Oration (1870) as the "categoric imperative" of Modern Medicine, which rigidly excludes all dualistic Animism from nineteenth century Philosophy. Hyloism or Materialism is thus enthroned as the Magna Charta and Monarchos of human Reason. The whole question is really so very simple that it seems to be only complicated by formal argument. On the hylo-phenomenal theory surely every one, learned or unlearned, ought to see that Self *must* be the sole author of its own world, both of sense and thought. All concrete objects, as we see or know them, can be only mental imagery, Deity not excepted. Solipsismal Egoism must be therefore to us the be-all and end-all of existence. Beyond that extreme limit of mortal vision we can never penetrate. Christ termed himself "*Son of God*," but Modern Science, *and especially Medicine*, caps his idea by divinising Humanity itself, by constituting Man, and every separate unit of mankind, *father* of God and of all things visible and invisible to human *Gnosis*.

ROBERT LEWINS, M.D.

September 18, 1884.

WASPS INDISCRIMINATE IN ANGER.

If your correspondent "J. C." should ever happen to pass a wasp's nest which has been recently disturbed, he will receive a very practical answer to his query in your last number.

EXPERIENTIA.

ANIMAL INTELLIGENCE.

PERCEIVING that the "Journal of Science" pays especial attention to the intelligence of the lower animals, I place at your disposal notice of a fact which I dare say some of your readers will be able to corroborate:—If a workman is allowed to bring his dog with him to any manufactory where he is employed, it is astonishing how quickly the animal finds out "who is who" in the concern. His profound respect for the head of the establishment, and for managers, foremen, and officer-bearers in general, forms an amusing contrast to his sauciness to private workmen.

J. C., of S.

INTERNATIONAL WEIGHTS AND MEASURES.

CERTAIN neighbouring nations conceive that they have just cause of complaint against Britain on account of her tardiness in adopting the metric system; but these grumblers, perhaps, forget that they, too, sin against international convenience. What, for instance, can be a greater nuisance to a non-German than the receipt of a letter or other document written in the German characters? He may be able to speak the language with fluency, correctness, and even elegance, yet, unless he has constant practice in deciphering German manuscripts, he is put to a serious loss of time, and may even be in doubt concerning some important word. Yet Germany shows no signs of a disposition to make this needed reform.

Were we to abandon our old system in favour of the metric standards, we should have to encounter a very tangible sacrifice. All our existing weights and measures, whether of length or capacity, would become so much waste material, involving a loss of probably not less than two millions sterling. In addition, many valuable works, tables, &c., on land-surveying, civil and mechanical engineering, &c., would be reduced to the rank of waste paper. Of the derangement in retail trade, which would fall heavily upon the poorer classes, I cannot here speak. Now what, on the other hand, would it cost Germany to adopt the written characters used by the rest of the civilised world? Practically nothing, except to the spectacle-makers, who would find short-sightedness diminish.

The French, on their part, have a mal-practice which they might very well immolate on the shrine of internationalism. I

mean their habit of distorting foreign names of places, sometimes even of persons, thus rendering their identification often a matter of doubt to a non-Frenchman. In a similar manner they murder scientific and technical terms of Greek or Latin origin. Surely it would be no great hardship for the French were they, in future, for intelligibility's sake, to leave foreign and classical names as they find them.

AN OLD TECHNOLOGIST.

THE MERIT OF MESSRS. THOMAS AND GILCHRIST *VERSUS* THE ARISTOCRACY.

A CONTEMPORARY of yours, whom I leave you to guess or to search out, winds up a slashing article with the dictum that "these young men have done more for England's greatness than all her aristocracy, kings and queens into the bargain." Now I should be very loth to depreciate the merit of Messrs. Thomas and Gilchrist, though, as their process is being worked in foreign countries more extensively than at home, it will leave our iron trade pretty much as it found it, if not in a relatively worse position. This, however, is no fault of the inventors.

But the writer to whom I refer seriously under-rates the intellectual achievements of the aristocracy. Robert Boyle and Henry Cavendish were members of the aristocracy. The Marquis of Worcester, the Viscount St. Albans (incorrectly termed Lord Bacon), and the Earl Dundonald were all peers. So in our own day are Lords Rayleigh and Walsingham. Sir Charles Lyell, though not a peer, belonged to the baronetage.

These instances, to which more might be added, prove that the aristocracy have done things for England's greatness fully equal, to say the least, with the invention of the Thomas and Gilchrist process.

JUSTITIA.

POLYGAMY IN CONNECTION WITH THE SUPERIOR SIZE OF MALE ANIMALS.

GREAT superiority of size and strength in any male animal, as compared with the female of the same species, seems to be so closely connected with polygamous habits, that the one fact may

be inferred from the other. But it is not sufficiently clear which is cause and which is effect. Is the physical superiority of the male an indirect result of polygamy, the perpetuation of the species being left to those individuals which prove victorious in the struggle for the possession of the females? Or is polygamy a consequence of the physical superiority of the males due to some other cause? If the former, we ask why the rivalry between the males, which is more or less common to all mammalian species, has not in all cases produced a marked excess of size and strength, and ultimately led to polygamy? If the latter, we have still to ask why the physical superiority of the male should in some species be so much more marked than in others?

AN EX-DARWINIAN.

[Polygamy seems to depend upon gregarious habits, and upon an ample and constant supply of food. Hence it is practically confined to phytophagous and omnivorous animals.—ED. J. S.]

NOTES.

THE following startling paragraph is taken from "Invention and Inventor's Mart":—"A contributor to a local contemporary hears of a house, not a hundred miles from the broad, open thoroughfare of High Holborn, in which there are no less than forty persons living, and in which there is no water laid on to flush the drains. This is a practical antithesis certainly to the Health Exhibition, at which scientific sanitarians are daily theorising."

"La Lumière Electrique" is represented by a technical contemporary as speaking of the "decomposition" of hydrogen in presence of a large number of bodies.

The water wagtails have an intense dislike for larks. The yellow wagtail, or "dish-washer" as he is called in some localities, never fails to chase away any sky lark which he happens to espy.

The late Prof. Dumas said—"If the causes of our marasmus appear complex and manifold they are still reducible to one principle,—administrative centralisation,—which, applied to the University, has enervated superior instruction."

Several chestnut trees on the Boulevard St. Germain, at Paris, which had lost all their leaves from the intense heat and drought, began to put forth fresh leaves and flowers about August 15th. The flower- and leaf-buds have not the same structure as those formed in early spring, which have to protect the future shoot against probable frosts.

"Ciel et Terre" has received a copy of the "Historical and Geographical Almanac of Artois" for 1784. It contains a notice of the pleading of M. de Robespierre—*the* Robespierre—before the Council of Artois in support of the appeal of his client, the Lord de Vissery de Bois-Valé, against a decree of the sheriffs of St. Omer, who had ordered him to remove a lightning-conductor which he had fixed to his house!

According to MM. Werner and Nœlting (Ind. Soc. Mulhouse) the poisonous properties of commercial benzol depend upon the presence of a small quantity of ethyl iso-cyanide.

"Ciel et Terre" records an extraordinary fall of hail on July 13th, at Lombartzyde, near Nieuport. Stones were collected weighing 1 kilo. each. The roofs of the houses were completely shattered.

E. Vial ("Les Mondes"), discussing the physiological part of iron in the animal organism, contends that the active principle in the arterial globules is potassium ferrate, which in contact with reducing agents is broken up into oxygen, hydrated ferric oxide, and anhydrous potassa. The latter compound, after saturating itself with carbon dioxide, conveys this body into the lungs.

The poisonous character of urea, when introduced into the tissues of animals, has been demonstrated experimentally by MM. Gréhaut and Quinquand. In rabbits the fatal dose is 661 m.grms. per 100 grms. of blood.

A letter by one Buissart, a Member of the Academies of Arras and Dijon, bearing date August 2nd, 1783, is abstracted in "Ciel et Terre." The writer speaks of the fogs which prevailed incessantly in June and July, 1783:—"The mixture of terrestrial exhalations, which give a variable and unusual colour to the disc of the sun, fills the public here with dread; everyone makes predictions, and a panic terror seizes even persons of education."

[Mr. Ruskin and the author of the "Vapour Year" would do well to study old meteorological records.]

M. A. Certes ("Comptes Rendus") has examined the effects of high pressures upon the bacterium of "charbon." He exposed infected blood for twenty-four hours to a pressure of 600 atmospheres. The blood retained its virulence, and cultivation experiments made with it succeeded perfectly. It seems to the author that in most cases there is a want of identity between the chemical processes, and even the microscopic agents of putrefaction, according as it takes place in the open air or under pressure.

Sir James Paget states that we lose in England and Wales every year, in consequence of sickness, "as much work as twenty millions of healthy people could do in a week." But considering the over-crowding of every trade, business, and profession, and the numbers of people unable to meet with employment, we may venture to ask could a week's work for twenty million people be found?

Complaints of over-work in German schools are abundant, and several decrees have already been issued, restricting the quantity of home-study required and limiting the classical studies.

Dr. Gressin and M. Bottard, of Havre, have discovered the poison-glands and emissive ducts of the fishes *Trachinus draco* and *T. vipera*. The venom, extracted and injected by means of a Pravez syringe into frogs, fishes, birds, and small mammals, quickly brought on clonic convulsions, collapse, and death. The opercular spines serve for the introduction of the poison; the mechanism is exactly the same as in the viper, only the spines, instead of having merely one channel like the fang of a death-snake, have each two.

According to "Ciel et Terre" the vibrations caused by the passing of a railway train, even at distances of 1300 to 1500 metres, make the use of delicate astronomical instruments impossible for the time being.

M. Pierre Picard considers the sun-spots as aërolites which have fallen into the sun, and which preserve on its incandescent surface the spheroidal state during the entire duration of the spot.

M. C. Fievez, of the Royal Observatory of Brussels, contends that the temperature of sun-spots is higher than that of the sun's disc, since the spectral rays of the former are broader than those of the latter.

M. G. Rafin, in a communication to the Academy of Sciences, describes a species of ant which he has observed in the island of St. Thomas, and which he proposes to call *Formica ignivora*. A large fire of wood having been kindled at a certain distance from the ant-hill, he saw the ants precipitate themselves into it by thousands, until it was completely extinguished.

M. W. Vignal ("Comptes Rendus") shows that there is no point in the embryonic development of the spinal marrow of vertebrate animals when it can be compared to a series of ganglia attached end to end, and resembling the nervous chain of the arthropods.

Herr Krasan, in "Engler's Jahrbuch," gives instances of the modification of plants by the action of insects, so as to produce new vatieties.

A certain Dr. O'Donnell proposed to visit the principal American cities, taking with him a couple of Chinese lepers as illustrations of a popular lecture. The authorites have refused their sanction.

We are glad to find that the "Medical Press and Circular" supports the proposal of scientific assessors in Courts of Law.

Extraordinary Freak of Nature: an Egg within an Egg.—Mr. W. T. Wiseman, F.R.G.S., &c., on opening a duck's egg, a few days ago, discovered inside, in addition to a perfect yolk, a small round egg, about the size of a pigeon's egg. The shell was hard, and the colour a beautiful electric blue. We should like Prof. Owen's explanation.

Our friend and contributor, Professor R. Galloway, has ready for the press a work on the Extraction and Manufacture of the Kelp-Products. The book will contain drawings of a kelp factory, with the different vessels all drawn to scale. The processes given for the manufacture of iodide and bromide of potassium, and the re-subliming of iodine, will enable the manufacturer to produce these important articles at a remunerative figure.

A writer in "Notes and Queries" says that, at a recent meeting of the Cambrian Archæological Society, Colonel Evans Lloyd exhibited a stone which was said to open at the death of any member of the family to which he belonged!

We are glad to find that a Natural History Club has been founded at Aylesbury.

It appears that an exhibition of noses has been held at Vienna. The first prize was awarded to the possessor of a huge nose of a purple hue!

Dr. J. E. Rombouts ("Archives du Musée Teyler) denies that the power of flies to walk on glass is due either to atmospheric pressure or to the exudation of a viscous liquid, and ascribes it to capillary attraction.

Prof. Young agrees with Dr. Gould that the effects of sun-spot periodicity, if they exist at all, are likely to be very different in different portions of the earth. . . . In some regions it may be warmer and drier during a sun-spot maximum, while in adjoining countries it is the reverse.

Dr. Dolan, in an essay on Rabies, remarks that "experiments properly conducted and properly interpreted will ultimately lead us to the discovery of the remedy." He adds:—"We need not expect that any Englishman will find this out, for we are so under the dominion of a false humanity that experiments on animals are out of the reach of many who might throw light on this disease."

We regret to announce the death of the eminent American microscopist, Dr. J. J. Woodward. The deceased, who may claim perhaps the highest rank in microscopic photography, was only in his fifty-first year.

A Mr. Thomas Bayley proposes, in place of cremation, to place the bodies, loosely wrapped in cotton-wool, on shelves in catacombs exposed to currents of cold air, dried by passing over calcium chloride. The fumes are to be passed through furnaces into the sewers. This scheme is far inferior to cremation, as being evidently much more costly, and as taking up room almost as much as burial.

Dr. Pringle ("Medical Press") declares that were it not for vaccination no European force could hold India.

The "American Naturalist" has an interesting notice of the abnormal diet occasionally indulged in by the domestic cat,—such as raisins, sugar-candy, figs, and preparations of Indian corn.

[We have known instances of cats stealing raisins; and Mr. Bates mentions the domestic cat as feeding on the fruit of a species of palm-tree, in Brazil.]

With reference to the letter of "Alastor," in our last issue, we quote from the "American Naturalist" some observations by Mr. Clarence M. Weed, of the Michigan Agricultural College. He writes:—"In five instances I saw a large species of *Bombus* fly from the flowers of the common lousewort (*Pedicularis Canadense*) to those of the vetch (*Vicia Americana*), and *vice versâ*. In another instance a *Bombus* went from a blue hyacinth to a columbine. Another went from the flowers of a small Solomon's seal (*Polygonatum biflorum*) to a dandelion. Another was working on vetch, from which it flew to the flowers of a trumpet honeysuckle (*Lonicera*), thus visiting in succession flowers belonging to different families."

Said Prof. Esmarch (as reported in the "Medical Press")—"Our students have been compelled to spend the best of their time in acquiring knowledge very desirable for a philologist, but for a future physician of very little use, and they frequently come to the University with *deadened senses*."

According to the "Medical Press and Circular" some very curious remedies have been proposed for cholera. One man recommends urine to be drank, and another water in which a healthy man has bathed!

The condition of the Paris Museum of Natural History is deplorable. Its entire income falls short of £40,000. Out of this sum have to be paid nineteen professors, fifty-six assistant-professors (*aides-naturalistes*), besides a large number of draughtsmen gardeners, librarians, secretaries, clerks, curators, laboratory servants, &c., in addition to the entire cost of keeping up the Jardin des Plantes, with its conservatories and menageries.

There are no laboratories for the professors of botany, geology, mineralogy, and comparative pathology. There is no botanical gallery, though there is a considerable botanical collection awaiting arrangement. There are no funds for utilising the land bought in the Bois de Vincennes for cultural experiments. There is no marine zoological station attached to the museum; the galleries of palæontology need improvements; an additional assistant is required to classify the anthropoda, and another for the mollusca, &c. The anthropological gallery and library need enlargement. The library contains 100,000 volumes, and was built to receive only 30,000.

According to "Science," the decrease of the forests in the Russian provinces of Moscow and Nishni-Novgorod has been attended by a deterioration of climate and a diminution of fertility. The Moscow Government used to be rich in fruit trees, but apples and cherries have now greatly fallen off in number, whilst pears have wholly disappeared.

Herr Christiani ("Verhandl. Physiol. Gesell. Berlin") has discovered in the brain the centre of co-ordination,—that is, a defined spot, the integrity of which is essential to the co-ordination necessary for locomotion, and for the maintenance of equilibrium during sitting and standing. Its destruction involves immediate and permanent abolition of the normal use of the limbs. It is situate in front of the inspiratory centre of the third ventricle.

ERRATUM.—In our September issue, p. 558, line 13, *for* "with acute mental" *read* "sentimental and."

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